User Manual

Power Wave 3

Emergency Lighting Inverter
10 KVA - 50 KW

Document No. 6002-1443
Revision M

Installation and
Operation

Due to continuous product improvements, this document is subject to change without notice.

TABLE OF CONTENTS

SECTION		PAGE
PROPRIETARY NOTICE		**C**
SECTION 1 - SAFETY		**1-1**
SECTION 2 - OVERVIEW		**2-1**
2.1	INTRODUCTION	2-1
	Illustration 2.1: Power Wave 3	2-1
2.2	BENEFITS	2-2
2.3	PRODUCT FEATURES	2-3
	Illustration 2.2: Component Layout	2-4
	Illustration 2.3: Sub Assembly Component Location	2-5
2.4	FUNCTIONAL DESCRIPTIONS	2-6
	Illustration 2.4: Functional Block Diagram for Single Input Power System	2-8
	Illustration 2.5: Functional Block Diagram for Dual Delta Input Power System	2-9
	Illustration 2.6: Functional Block Diagram for Dual Wye Input Power System	2-10
2.5	THEORY OF OPERATION	2-11
2.6	OUTPUT LOADS	2-12
SECTION 3 - OPERATION		**3-1**
3.1	START-UP PROCEDURES	3-1
3.2	OPERATION	3-3
3.3	FIELD REPLACEABLE UNITS	3-3
	Illustration 3-1: 40KVA and lower Heat Sink Assembly (FRU)	3-4
	Illustration 3-2: 50 KVA and up Heat Sink Assembly (FRU)	3-5
3.4	REPLACEABLE PARTS LIST	3-6
SECTION 4 – SYSTEM OPTIONS		**4-1**
4.1	MAINTENANCE BYPASS SWITCH	4-2
	Illustration 4-1: External Maintenance Bypass Switch Diagram	4-2
	Illustration 4-2: Maintenance Bypass Switch	4-4
4.1.3	External Manual Bypass Switch	4-5
4.2	AUDIO ALARM WITH SILENCE SWITCH	4-6
4.3	REMOTE UPS STATUS PANEL	4-6
	Illustration 4-2-1: Remote Status Panel	4-6
4.4	FORM “C” CONTACTS FOR ALARMS	4-7
4.5	Optional TVSS	4-7
4.6	NORMALLY ON NORMALLY OFF OUTPUT AUX. CIRCUIT BREAKERS	4-7
4.7	EXTERNAL OUTPUT AUX.CIRCUIT BREAKERS	4-8
	Illustration 4-3: UPS with External Load Center	4-8
4.8	10% INPUT CURRENT HARMONIC FILTER	4-9
4.9	5% INPUT CURRENT HARMONICS FILTER	4-9
4.10	EMI FILTER	4-9
4.11	OPTIONAL HIGHER KAIC NORM ON/OFF OUTPUT CIRCUIT BREAKERS	4-9
4.12	DUAL INPUT SYSTEM WYE/WYE	4-10
4.13	DUAL INPUT SYSTEM DELTA/WYE	4-10

SECTION		PAGE
4.14	DUAL INPUT SYSTEM DELTA/DELTA	4-10
4.15	SEISMIC MOUNTING BRACKET	4-10
4.16	STACKABLE RACK	4-10
4.17	Global Monitoring System (GMS)	4-11
4.17.1	Local on PC via RS 232	4-11
	Illustration 4-8: Sample PC Screen	4-11
4.17.2	Local on PC via RS 485	4-11
4.17.3	Remote Dial Up: Data, Voice, Fax, Pager, PC, E-mail, Event Log, and Stats	4-12
	Illustration 4-9: Monitoring 2000 Front View	4-12
	Illustration 4-10: Manager 2000 Screen	4-12
4.18.	ECC – EMERGENCY CIRCUIT CONVERTER	4-19
4.19	ECM – EMERGENCY CONTROL MODULE	4-20
SECTION 5 - MAINTENANCE		**5-1**
5.1	SAFETY PRECAUTIONS	5-1
5.2	WHEN TO CALL	5-3
5.3	STEPS TO TAKE	5-3
5.4	PREVENTIVE MAINTENANCE	5-4
5.5	ONLINE POWER CUSTOMER SERVICE AND SUPPORT	5-8
APPENDICES		
	APPENDIX A – SPECIFICATIONS	A-1
	APPENDIX B – BATTERY CONNECTIONS	B-1
	APPENDIX C – LCD DISPLAY MENU AND TROUBLE SHOOTING GUIDE	C-1
	APPENDIX D – DRAWINGS & TABLES.	D-1
SECTION 6 - INSTALLATION		**6-1**
6.1	SITE PLANNING AND PREPARATION	6-1
	Table 6-A: Site Planning Specifications	6-1
	Illustration 6-1: Cable Access and Mounting	6-2
	Illustration 6-2:UPS Cabinet Center of Gravity	6-3
	Illustration 6-3: Battery Cabinet Center of Gravity	6-4
6.2	EQUIPMENT UNPACKING	6-5
	Illustration 6-4: Fork lifting	6-5
6.3	UNIT INSTALLATION	6-6
	Illustration 6-5: Power Wave Customer's Connection	6-7
6.4	REMOTE SIGNALLING CONNECTIONS FORM "C" DRY CONTACT (OPTIONAL)	6-8
6.5	BATTERY STORAGE	6-9

OnLine Power, Inc.
Reproduction or Distribution forbidden

NOTICE: THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION

This document contains proprietary and confidential information of OnLine Power, Inc. (”OnLine Power”). In consideration of the receipt of this document, the recipient agrees not to copy any of its contents, nor to disclose them to or allow them to be used by any person not currently an OnLine Power employee or an employee of the recipient having a need to know, without the express written consent of OnLine Power, and further agrees to surrender this document to OnLine Power when the reason for its receipt has terminated. Due to continuous product improvement, this document is subject to change without prior notice.

© 2009 OnLine Power, Inc. – All rights reserved

OnLine Power

Congratulations on selecting one of the fine products from OnLine Power, the leader in power protection technology. Our wide product offering includes UPS (**U**ninterruptible **P**ower **S**ystems), power conditioners, automatic voltage regulators and specialty transformers (e.g., computer-grade, medical-grade). Since our founding in 1972, OnLine Power has shipped many of these fine products to discerning customers around the world for use on sensitive equipment and in critical applications.

One of our goals is to make our manuals both comprehensive and easy to use. The new format of our user manual is the result of ideas and inputs from customers like you who have taken an active interest in our continued success. We invite and appreciate your feedback on our products and documentation via e-mail, fax, mail, or telephone.

SALES
Phone: (800) 227-8899
FAX No: (323) 721-3929
E-mail: sales@onlinepower.com

Office Hours are 7:00 AM to 5:00 PM PST

WARRANTY REGISTRATION AND WARRANTY CERTIFICATE REQUEST
www.800pwrsrvc.com

SERVICE

If you require assistance, please call our 24-hour toll free hot line **800-PWR-SRVC** (800-797-7782) or email to info@800pwrsrvc.com. Please have the following information from your unit's nameplate available to speed assistance:

Serial Number: _____

KVA/Power Rating: _____

Input Voltage: _____

Output Voltage: _____

Manufacturer Date: _____

Due to continuous product improvement this document is subject to change without prior notice.

SECTION 1 - SAFETY

Following safety precautions are important when operating or servicing electrical equipment. The symbols shown are used extensively throughout this manual. Always heed these precautions since they are essential to the safe operation and servicing of this product.

Boxes labeled with the "**Danger!**" symbol indicate that there is a high risk of personal injury or death if instructions are not followed.

Warnings labeled with the **Caution** symbol indicate that there is a high probability of equipment malfunction, damage, or destruction if instructions are not followed.

Danger!

ONLY FACTORY TRAINED OR AUTHORIZED PERSONNEL SHOULD ATTEMPT TO INSTALL OR REPAIR THE UNIT OR ITS BATTERY SYSTEM. IMPROPER INSTALLATION HAS PROVEN TO BE THE SINGLE MOST SIGNIFICANT CAUSE OF START-UP PROBLEMS. HIGH AC AND DC ELECTRICAL VOLTAGES ARE PRESENT THROUGHOUT THE UNIT (S) AND INCORRECT INSTALLATION OR SERVICING COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT MALFUNCTION.

Danger!

READ THIS MANUAL IN ITS ENTIRETY BEFORE PERFORMING INSTALLATION, START-UP, OPERATION, AND MAINTENANCE OF THE UNIT OR BATTERY SYSTEMS. FAILURE TO DO SO COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT MALFUNCTION.

If you require assistance, calls toll free 800-PWR-SRVC (800-797-7782). Please have the following information from your unit's nameplate available to speed assistance:

Serial Number: _____

KVA/Power Rating: _____

Input Voltage: _____

Output Voltage: _____

Manufacturer Date: _____

Danger!

ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN WHO IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DAMAGE TO THE EQUIPMENT, INJURY OR DEATH OF PERSONNEL. VERIFY THAT ALL HIGH AND LOW VOLTAGE INPUT POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

Danger!

EXERCISE EXTREME CARE WHEN HANDLING UNIT AND BATTERY CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. CABINETS WEIGH SEVERAL HUNDRED POUNDS.

Danger!

TEST LIFT AND BALANCE THE CABINETS BEFORE MOVING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES. THE BOTTOM STRUCTURE WILL SUPPORT THE UNIT ONLY IF THE FORKLIFT FORKS ARE COMPLETELY UNDERNEATH THE UNIT.

Danger!

OBSERVE ALL BATTERY SAFETY PRECAUTIONS DURING INSTALLATION OR SERVICE OF THE UNIT OR BATTERIES. EVEN WITH THE BATTERY CIRCUIT BREAKER IN THE OFF POSITION, THE DANGER OF ELECTROCUTION MAY STILL BE PRESENT. THE BATTERY POWER TO THE UNIT MUST BE LOCKED AND TAGGED "OFF" BEFORE PERFORMING ANY SERVICE OR WORK ON THE UNIT. THE BATTERY MANUFACTURER'S SAFETY INFORMATION AND MATERIAL SAFETY DATA SHEET IS LOCATED IN A POCKET ATTACHED TO THE INSIDE OF LEFT DOOR OF EACH UNIT. FAILURE TO FOLLOW INSTRUCTION LISTED ABOVE AND ELSEWHERE IN THIS MANUAL COULD RESULT IN AN EXPLOSION, FIRE, EQUIPMENT MALFUNCTION, OR ELECTROCUTION.

Danger!

ALL POWER TO THE UNIT MUST BE LOCKED AND TAGGED "OFF" BEFORE PERFORMING ANY SERVICE OR WORK ON THE UNIT. FAILURE TO DO SO COULD RESULT IN ELECTROCUTION.

Danger!

IN A FIRE INVOLVING ELECTRICAL EQUIPMENT, ONLY USE CARBON DIOXIDE FIRE EXTINGUISHERS, OR THOSE APPROVED FOR USE ON ELECTRICAL EQUIPMENT. USE OF WATER ON FIRES INVOLVING HIGH VOLTAGE ELECTRICAL CIRCUITS COULD RESULT IN ELECTROCUTION .

Danger!

EXTREME CAUTION IS REQUIRED WHEN PERFORMING MAINTENANCE. LETHAL VOLTAGES EXIST WITHIN THE EQUIPMENT DURING OPERATION. OBSERVE ALL WARNINGS AND CAUTIONS IN THIS MANUAL. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY OR DEATH. OBTAIN QUALIFIED SERVICE FOR THIS EQUIPMENT AS INSTRUCTED.

Danger!

BE CONSTANTLY AWARE THAT THE UNIT SYSTEM CONTAINS HIGH DC AS WELL AS AC VOLTAGES. WITH INPUT POWER OFF AND THE BATTERY, DISCONNECTED, HIGH VOLTAGE AT THE FILTER CAPACITORS AND POWER CIRCUITS SHOULD DISCHARGE WITHIN 30 SECONDS. HOWEVER, POWER CIRCUIT MALFUNCTIONS CAN OCCUR, SO YOU SHOULD ALWAYS ASSUME THAT HIGH VOLTAGE MIGHT STILL EXIST AFTER SHUTDOWN. VERIFY THAT POWER IS OFF USING AC AND DC VOLTMETERS BEFORE MAKING CONTACT.

Danger!

SOME COMPONENTS WITHIN THE CABINETS ARE NOT CONNECTED TO CHASSIS GROUND. ANY CONTACT BETWEEN FLOATING CIRCUITS AND THE CHASSIS IS A LETHAL SHOCK HAZARD.

Danger!

INTERNAL BATTERY STRAPPING MUST BE VERIFIED BY THE CUSTOMER PRIOR TO MOVING THIS UNIT.

THIS UNIT CONTAINS NON-SPILLABLE BATTERIES. KEEP THE UNIT UPRIGHT. DO NOT STACK. DO NOT TIP. ALWAYS FOLLOW THE BATTERY MANUFACTURER'S SAFETY INFORMATION LOCATED IN A POCKET ATTACHED TO THE INSIDE OF THE LEFT DOOR OF YOUR UNIT TO PREVENT AN ACCIDENT THAT COULD RESULT IN INJURY OR DEATH.

Danger!

LEAD-ACID BATTERIES CONTAIN HAZARDOUS MATERIALS. BATTERIES MUST BE HANDLED, TRANSPORTED, AND RECYCLED OR DISCARDED IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. BECAUSE LEAD IS A TOXIC SUBSTANCE, LEAD-ACID BATTERIES MUST BE RECYCLED OR DISCARDED AS HAZADEROUS WAIST.

DO NOT DISPOSE OF BATTERIES IN A FIRE, THE BATTERIES MAY EXPLODE.

DO NOT OPEN OR MUTILATE THE BATTERIES. RELEASED ELECTROLYTE IS HARMFUL TO THE SKIN AND EYES AND MAY BE TOXIC.

A BATTERY CAN HAVE A HIGH SHORT CIRCUIT CURRENT AND PRESENT A RISK OF ELECTRICAL SHOCK. THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED WHEN WORKING ON BATTERIES:

1. **REMOVE WATCHES, RINGS OR OTHER METAL OBJECTS.**
2. **USE TOOLS WITH INSULATED HANDLES.**
3. **WEAR RUBBER GLOVES AND BOOTS.**
4. **DO NOT LAY TOOLS OR METAL PARTS ON TOP OF BATTERIES.**
5. **DISCONNECT CHARGING SOURCE PRIOR TO CONNECTING OR DISCONNECTING BATTERY TERMINALS.**
6. **DETERMINE IF BATTERY IS INADVERTENTLY GROUNDED. IF SO, REMOVE THE SOURCE OF THE GROUND. CONTACT WITH ANY PART OF A GROUNDED BATTERY CAN RESULT IN ELECTRICAL SHOCK. THE LIKELIHOOD OF SUCH SHOCK WILL BE REDUCED IF SUCH GROUNDS ARE REMOVED DURING INSTALLATION AND MAINTENANCE.**
7. **LEAD-ACID BATTERIES CAN PRESENT A RISK OF FIRE BECAUSE THEY GENERATE HYDROGEN GAS. THE FOLLOWING PROCEDURES SHOULD BE FOLLOWED:**
   1. **DO NOT SMOKE WHEN NEAR BATTERIES.**
   2. **DO NOT CAUSE FLAME OR SPARK IN BATTERY AREA.**
8. **DISCHARGE STATIC ELECTRICITY FROM YOUR BODY BEFORE TOUCHING BATTERIES BY FIRST TOUCHING A GROUNDED SURFACE.**

SECTION 2 – OVERVIEW

2.1 INTRODUCTION

Power Wave 3 Central Lighting Inverters are manufactured to provide critical power for lighting during a power outage. The Power Wave 3 meets or exceeds life safety codes of UL924, UL924A (as an option for shorter than 90 minutes use in conjunction with a generator), UL1778 and NFPA101. These codes were established to allow emergency lighting inverters to provide critical power to lighting circuits during a power malfunction. The emergency lighting inverter will provide power for 90 minutes to allow safe and orderly evacuation from the facility.

When input power to the Power Wave 3 is lost during a power outage, the system will automatically draw power from its battery bank supply without any interruption and with zero transfer time. The critical load will receive only clean sine wave power. The output transformer provides multiple output voltages as well as input voltages that are different than the output voltages. The standard VRLA (Valve Regulated Lead-acid), maintenance-free batteries provide 90 minutes of backup power as standard.

Upon restoration of input power, the Power Wave 3 automatically resumes normal operation, and immediately begins to recharge the batteries for the next power outage.

The Power Wave 3 has an internal bypass circuit, which maintains the power to the load in case of internal system or component malfunction.

The Power Wave 3 provides comprehensive monitoring capabilities. In addition to the LCD display, it provides four dry relay contacts for remote monitoring capabilities. The Power Wave 3 contains, as standard features, AS 400, RS 232, RS485 data transmission ports with optional soft-ware and many other communication options.

The Power Wave 3 is an on-line three phase PWM high frequency, digital signal processing, true double conversion inverter system available in output ratings of 10, 15, 20, 25, 30, 40, 50 KVA and 50 KW. The Power Wave 3 is listed for compliance to UL1778, UL924, UL924A and CSA107.1 standards. The Power Wave 3 is available with an input or output voltages of 480Y/277 or 208Y/120 VAC, three phase. This information is provided on the nameplate located on the inside front door of the unit. See Appendix A for a complete listing of the Power Wave 3 specifications.

The Output transformer performs two critical functions. First, it provides excellent common mode and normal mode noise isolation of the load from the input or inverter power. Secondly, it provides voltage transformation and tight regulation of the output voltage while the Power Wave is operating from its internal inverter and it can be utilize to provide a different voltage than input (source voltage).

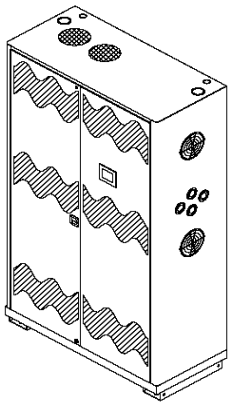


ILLUSTRATION 2-1 POWER WAVE 3

2.2 BENEFITS

Power Wave 3 is a self-contained simple solution for back-up power for any fluorescent or incandescent lighting source such as overhead fixtures, exit signs, etc. It has been specifically designed to maintain 90 minutes of lighting power and ensure a safe building evacuation.

In addition, since electrical disturbances can come from practically anywhere, e.g., from the incoming power lines, from within a building, outside electrical disturbances include lightning strikes, utility switching, brown-outs, and accidents. Electrical disturbances in a facility can be caused by load cycling (elevators, HVAC systems, etc.), fault conditions, welders, and other electrical noisy equipment. Whether the electrically disturbances are generated outside or within the facility, the following power problems can occur:

- Complete power outages.
- Brown-outs including momentary sags.
- Voltage surges.
- Transients including common-mode and transverse-mode noise.
- Frequency shifts and fluctuations.

The Power Wave 3 offers significant advantages over other alternatives. For example, just one of the smallest Power Wave 3 Central Lighting Inverters can replace over 70 ”bug eyes” to make service and maintenance in a centralize place much quicker and easier.

The air cooled, OnLine PWM (zero transfer) inverter system, is virtually silent and can be installed anywhere.

On-line PWM technology provides switchover from utility to battery power without any interruption.

The Power Wave 3 is designed to fit the needs of virtually all power conditioning and emergency lighting backup applications. It has been designed to power all forms of lighting fixture including HID, incandescent, fluorescent light, communication, and process control equipment. The Power Wave 3 does not require any de-rating, as other products may, when powering 100% lighting fixture including switching mode power supplies and or HID, incandescent, fluorescent lights.

2.3 PRODUCT FEATURES

The Power Wave 3 is designed in module concept for ease of maintenance and repair, all electronic are centralize in two-assembly module. The following describes the major blocks within the Power Wave 3. Please refer to Illustration 2-2 Subassembly Component Location to find specific items.

2.3.1 Input Contactor K1 (Illustration 2-3, Item 20)

The input contactor is multifunctional. First, it provides connections for the input power to the unit. Secondly, the contactor disconnects the input line when an outage occurs so that there is no back feeding of power into the power line. Finally, the contactor allows for automatic unit operation upon a complete discharge of the batteries. No operator intervention is required when power to the unit is restored after a complete battery discharge.

2.3.2 Input Transformer (T3) (Illustration 2-2, Item 2)

The input transformer adjusts the input voltage for proper rectifier DC voltage, depending on the unit rated power and back-up capacity.

2.3.3 Battery Charger (Illustration 2.3, Electronics Tray)

The constant power battery charger maintains the batteries at full charge while utility power is available. After a battery discharge, the charger will automatically recharge the batteries upon restoration of input power. This circuit is on the Power Board.

2.3.4 Power Board Assembly with IGBT's (Illustration 2.3, Item 3)

The Power Board is bolted onto the IGBT (**I**nsulated **G**ate **B**ipolar **T**ransistor) blocks that are mounted on a heat sink. The complete Heat Sink Assembly with IGBTs and Power Board is replaceable as a single part. This FRU (**F**ield **R**eplaceable **A**ssembly) converts all the power, i.e. input AC power converted to DC bus, battery power boosted to DC bus, and finally DC bus power converted to output AC power using PWM with digital signal processing technology for a smooth AC sine wave. In case of a malfunction, the complete Heat Sink Assembly is easily replaceable using only a screwdriver. The Power Board also contains the housekeeping power supplies and drivers for the IGBTs. The entire assembly provides the landing place for all internal input, output, DC cables and metering devices for control and monitoring of the unit input and output parameters.

2.3.5 Control Board (Illustration 2.2, Item 10)

The on board microprocessor with unit specific firmware and control circuitry is located on the Control Board. The Control Board is mounted on the cabinet door and communicates with the Power Board (A2) via a ribbon cable. It monitors the input and output voltages and generates the command to close or open the input contactor and to sense and change the status of the bypass static switch. The Control Board sends data to the LCD panel located on the door where actual status and parameters are displayed. It additionally has AS400, RS232 and RS485 output capabilities and supports various communication options.

2.3.6 Static Bypass Switch (Illustration 2.2, Item 18)

The Static Bypass Switch is a fully rated solid-state device capable of switching the critical load between the inverter output and the normal AC by pass line. In the event of a system output overload of 125% or more of the unit full-load current rating, a make-before-break (both directions) transfers power to the bypass source via a static switch.

2.3.7 LCD Display Panel (Illustration 2.2, Item 11)

The unit display, via a 4 by 20 backlit character display, provides all the input, output, battery metering, alarm data, and unit status for customer use on a constantly scrolling set of two monitor measurement default screens with continuous update at a very high frequency.

2.3.8 Output Isolation Transformer (Illustration 2.2, Item 1)

The output isolation transformer provides isolation between the inverter and critical load. The power to the primary of this transformer is received form the unit and is transformed to required output voltage levels.

2.3.9 Maintenance Bypass Switch (Illustration 2.2, Item 28)

The MBS (**M**aintenance **B**ypass **S**witch) removes the critical load from the backup power and providing utility input directly to the load in case of a malfunction of the unit or during system maintenance.

2.3.10 Battery Bank – located in External Battery Cabinet(s)

The battery bank consists of sealed, maintenance-free valve regulated (VRLA Type) batteries as standard. The batteries provide emergency power during power outages. The battery bank includes a breaker for over current protection and DC disconnect for each cabinet or string to allow the servicing of the battery.

2.3.11 System Component Layout

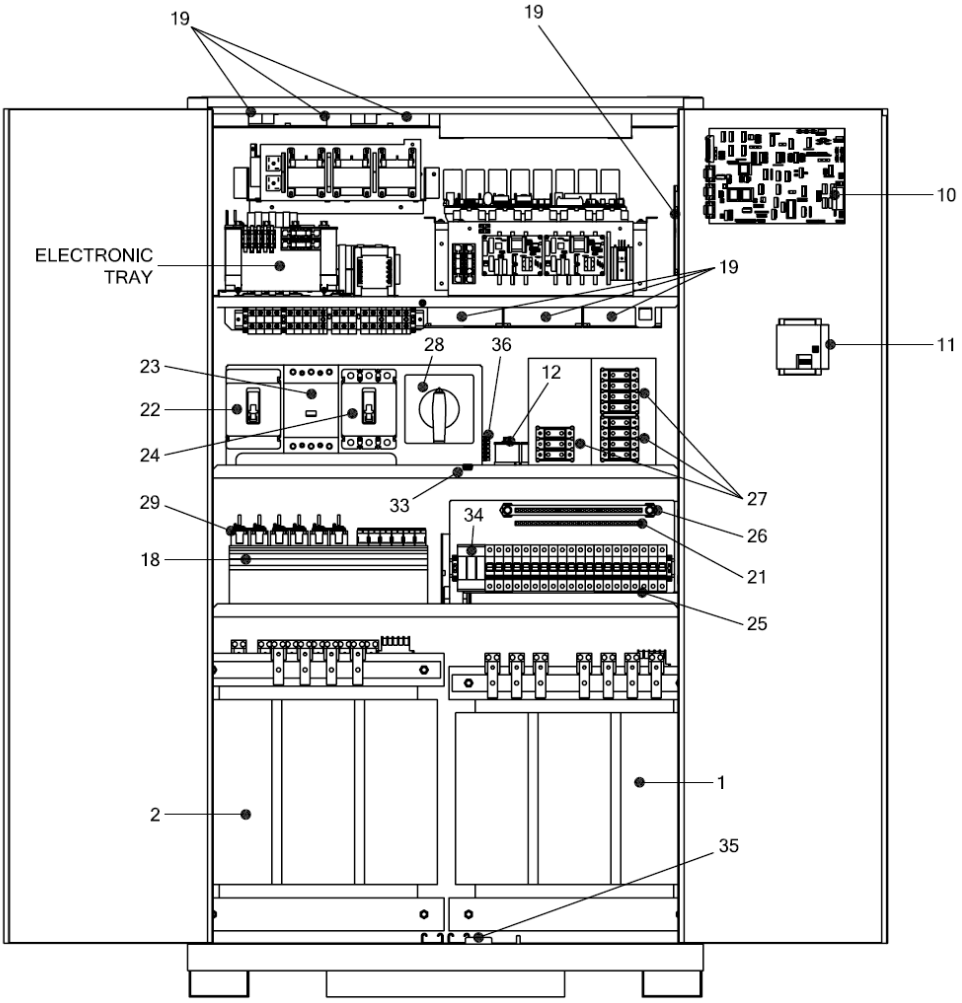
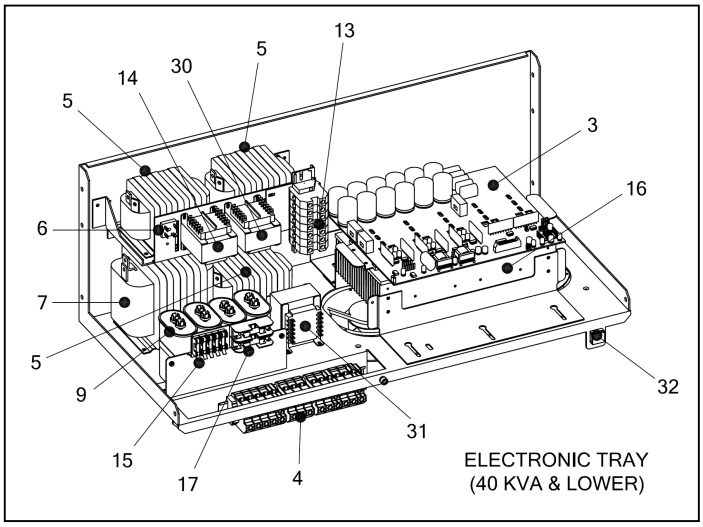


ILLUSTRATION 2-2: COMPONENT LAYOUT

1. Output Transformer (T1)
2. Input Transformer (T3)
3. Power Board Assembly (A1)
4. Interconnect Terminal Block (Input T4B, Output TB1, Battery TB3, DC B5)
5. Output Inductor (L2)
6. Diode Bridge (Pre-charge)
7. DC Choke (L4)
9. High Frequency Noise Filter Capacitors, Output and Battery Power
10. Control Board (A2)
11. LCD Display Board
12. Output High Frequency Filter (C5, C6, C7)
13. Terminal Block to remove heat sink assembly (TB4)
14. Control Power (40 kva and lower) Transformer (T2A)
15. Fan Fuse (F3 - F6)
16. IGBT Heat Sink Assembly
17. Control Fuses (F2, F1)
18. Heat Sink (Bypass SCR)
19. Fan(s) (B1 - B6)
20. Input Contactor (K1)
21. Ground Terminal (Option w/ item 25)
22. Input Breaker (CB1)
23. Battery Breaker (CB2)
24. Output Breaker (CB3)
25. Output Distribution Breakers (Optional)
26. Neutral Bus (Option w/ item 25)
27. Customer Input/Output Connection Terminal Blocks
28. Maintenance Bypass Switch (SW1)
29. SCRs and Snubbers
30. Contactor Coil Transformer (T5)
31. Fan Transformer (T4)
32. Inverter Test Switch
33. RS232 /RS485 (Option)
34. TVSS (Option)
35. Ground Lug
36. 5 Form “C” Alarm Terminal (Option)
37. MBS **S –1** Toggle Switch or maintenance bypass switch with 3 positions.



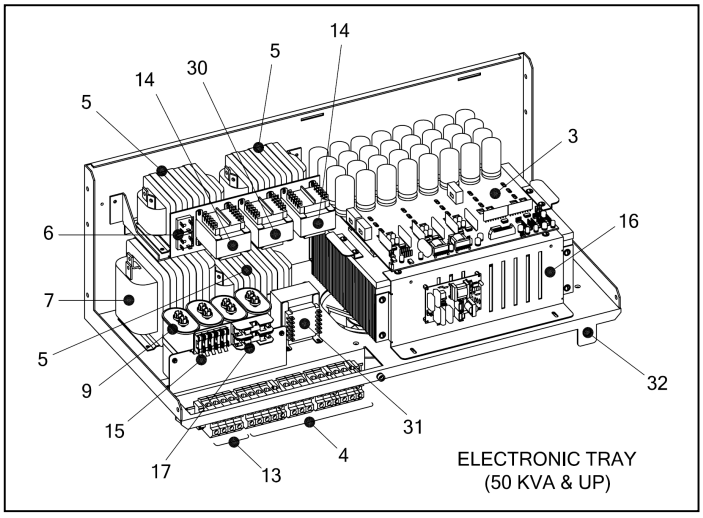


ILLUSTRATION 2-3: SUB-ASSEMBLY COMPONENT LOCATION

2.4 FUNCTIONAL DESCRIPTION

Illustrations 2-2 thru 2-6 depict functional block diagrams of the Power Wave 3. These diagrams provide an excellent tool for identifying the major building blocks within the Power Wave.

2.4.1 Main input circuit breaker - optional

The main input circuit breaker provides Power Wave 3 with incoming power isolation as a well as means of disconnect and input over current protection.

2.4.2 Input Contactor

The Input contactor controls power applied to the unit. The microprocessor control circuit verifies that the unit is in “normal” condition and that the input voltage and frequency are within an acceptable range. When the unit transfers to the battery, it disconnects the source so the batteries do not feed back to the utility.

2.4.3 Input Inductors

The input inductors are a three-phase input filter.

2.4.4 Inverter

The inverter provides continuous power to the load. When the AC input power is not available, the inverter converts the energy stored in the battery bank to AC power to supply the load. The PWM (Pulse Width Modulation) inverter utilizes high frequency, digital signal processing with high efficiency IGBTs for fast accurate measurement and response.

2.4.5 Battery charger

The constant power battery chargers supply DC power to re-charge and to maintain the charge on the battery bank. The charger is fully automatic with a current tapering feature so that battery damage will be prevented in case of a charger malfunction or increased battery temperature. The charger is sized to maintain a full charge even when the input voltage at is the low line limit for indefinite periods of time meets and exceeds the UL 924 requirement.

2.4.6 Battery

The battery bank; consist of 16, 24, 26 or 46, 12-volt batteries (depending on the unit's specified capacity), providing the reserve energy to sustain the load when suitable AC input power is not present. The batteries are designed and tested to meet UL 924 requirements. The standard VRLA (**V**alve **R**egulated **L**ead **A**cid) batteries are sealed and maintenance-free.

2.4.7 DC Choke

The DC choke helps boost battery voltage to a higher internal DC bus voltage while it reduces high frequency noise.

2.4.8 Output AC Inductor

The Output AC Inductor acts as a filter circuit component to reduce high frequency noise to the output transformer.

2.4.9 Output Transformer

The Output transformer performs two critical functions. First, it provides excellent common mode and normal mode noise isolation of the load from the input or inverter power. Secondly, it provides voltage transformation and tight regulation of the output voltage while the Power Wave is operating from its internal inverter and it can be utilize to provide a different voltage than input (source voltage).

2.4.10 Inverter Test Switch

The Inverter Test Switch is a momentary push button for manually testing the Power Wave 3 and its batteries for proper operation. With Power Wave 3 in operation, the test switch is pushed and held; the unit will automatically transfer to battery operation manually. The unit will continue to run on batteries until the switch is released. Upon release, the Power Wave 3 transfers back to utility from the battery and resumes normal operation.

2.4.11 Input Transformer

The Input Transformer conditions the voltage ahead of the DC rectifier, and supplies power to the inverter and battery charger.

2.4.12 Maintenance Bypass Switch (MBS)

This Maintenance Bypass Switch (MBS) allows the Power Wave 3 to be switched off line for maintenance or troubleshooting when the inverter malfunctions or PM (Periodic Maintenance) is required. The MBS transfers the input power directly to critical load without any break or power disruption. Before switching the MBS to the maintenance position, turn on toggle switch S1 if unit is so equipped, and then rotate the maintenance bypass switch to the maintenance (MAN) position. Refer to the operation label on the unit. After repair or periodic maintenance, the MBS must be switched to UPS position, in cases where the toggle switch has been incorporated with the switch, be sure not to leave the switch in the middle position as this will not provide any output power when the unit is off.

Caution!

STOPPING ROTATION OF THE MAINTENANCE BYPASS SWITCH BETWEEN POSITIONS WILL RESULT IN THE REMOVAL OF OUTPUT VOLTAGE.

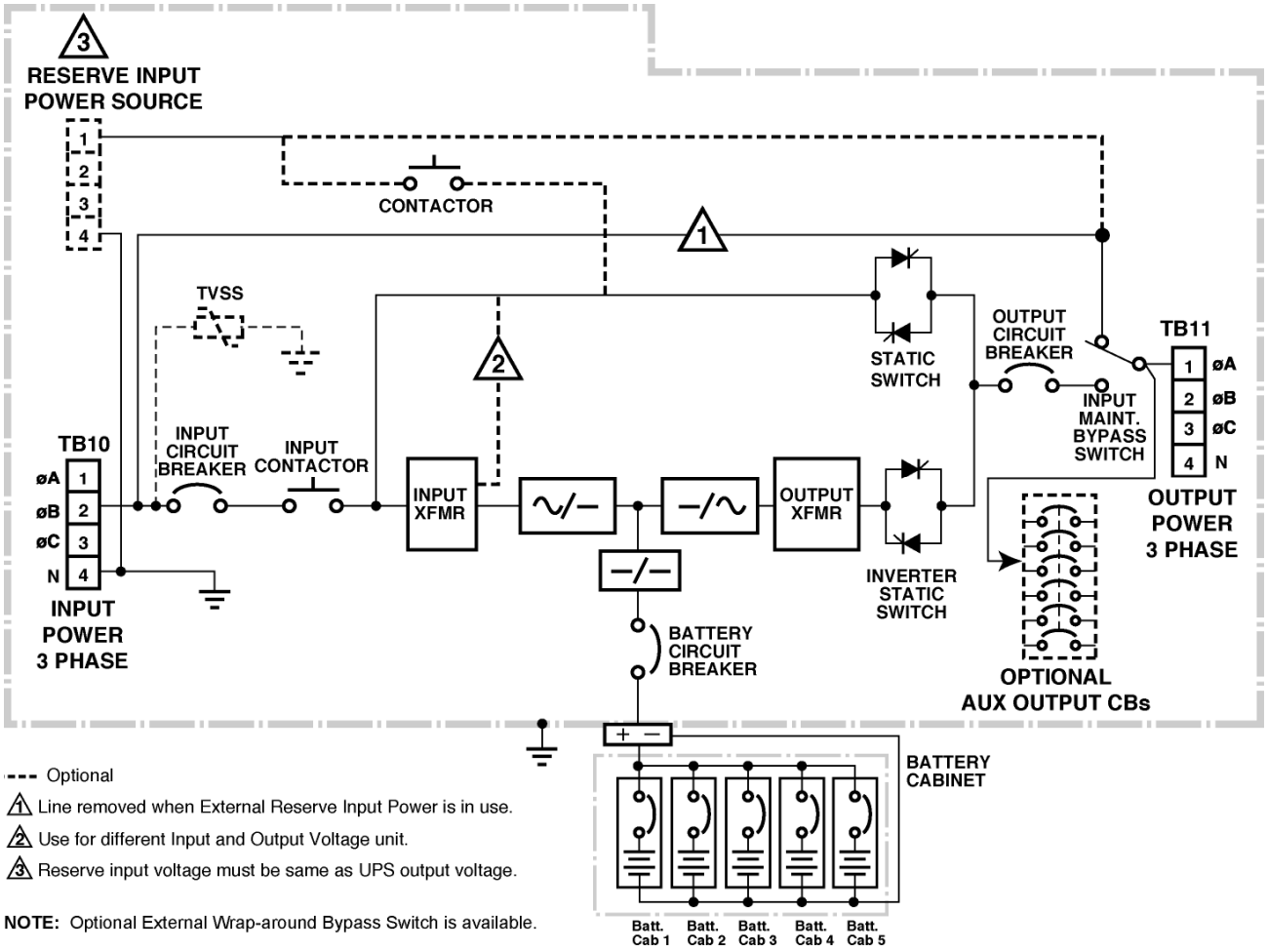


ILLUSTRATION 2-4: FUNCTIONAL BLOCK DIAGRAM FOR SINGLE INPUT POWER

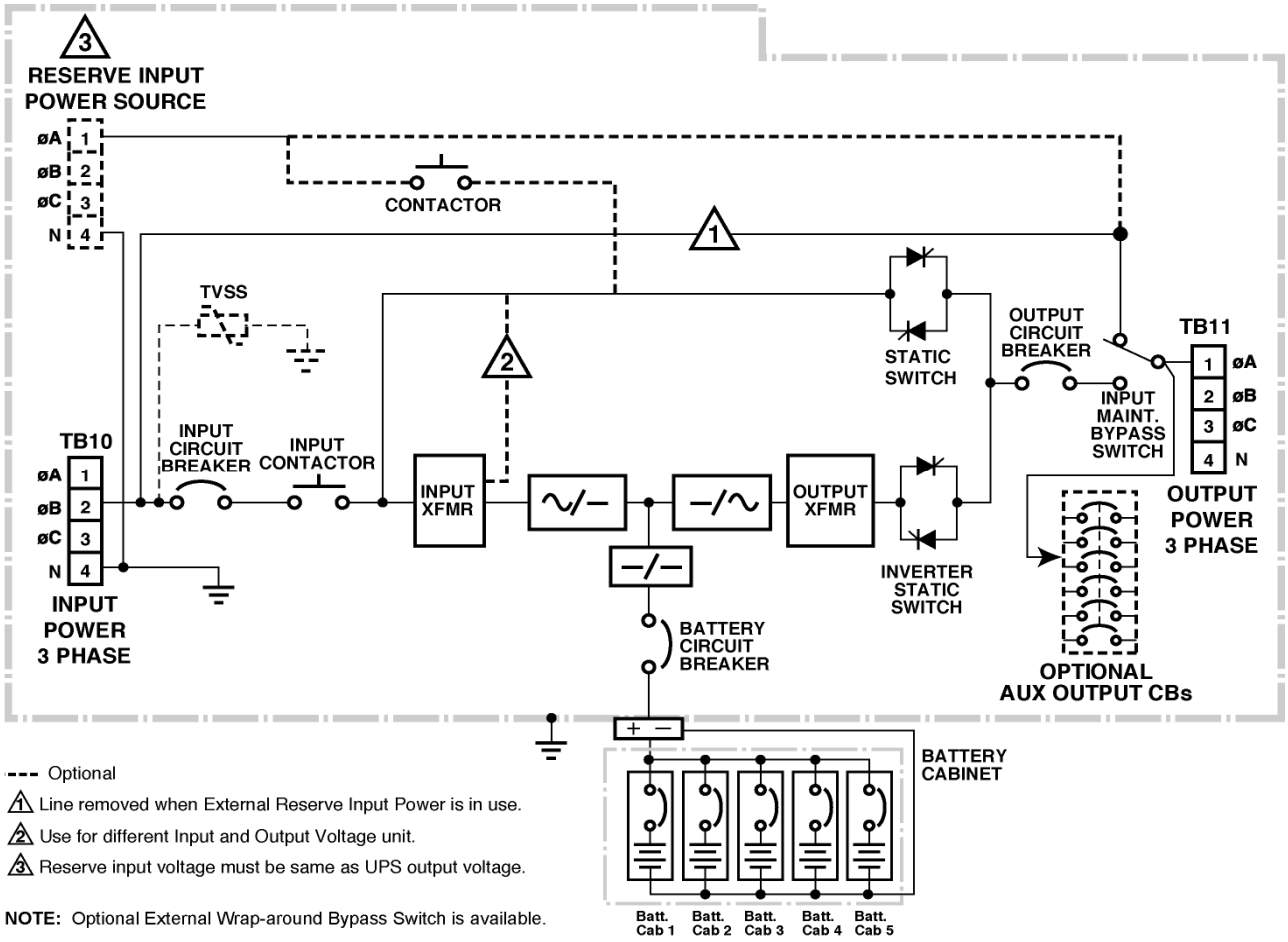


ILLUSTRATION 2-5: FUNCTIONAL BLOCK DIAGRAM FOR DUAL DELTA INPUT POWER

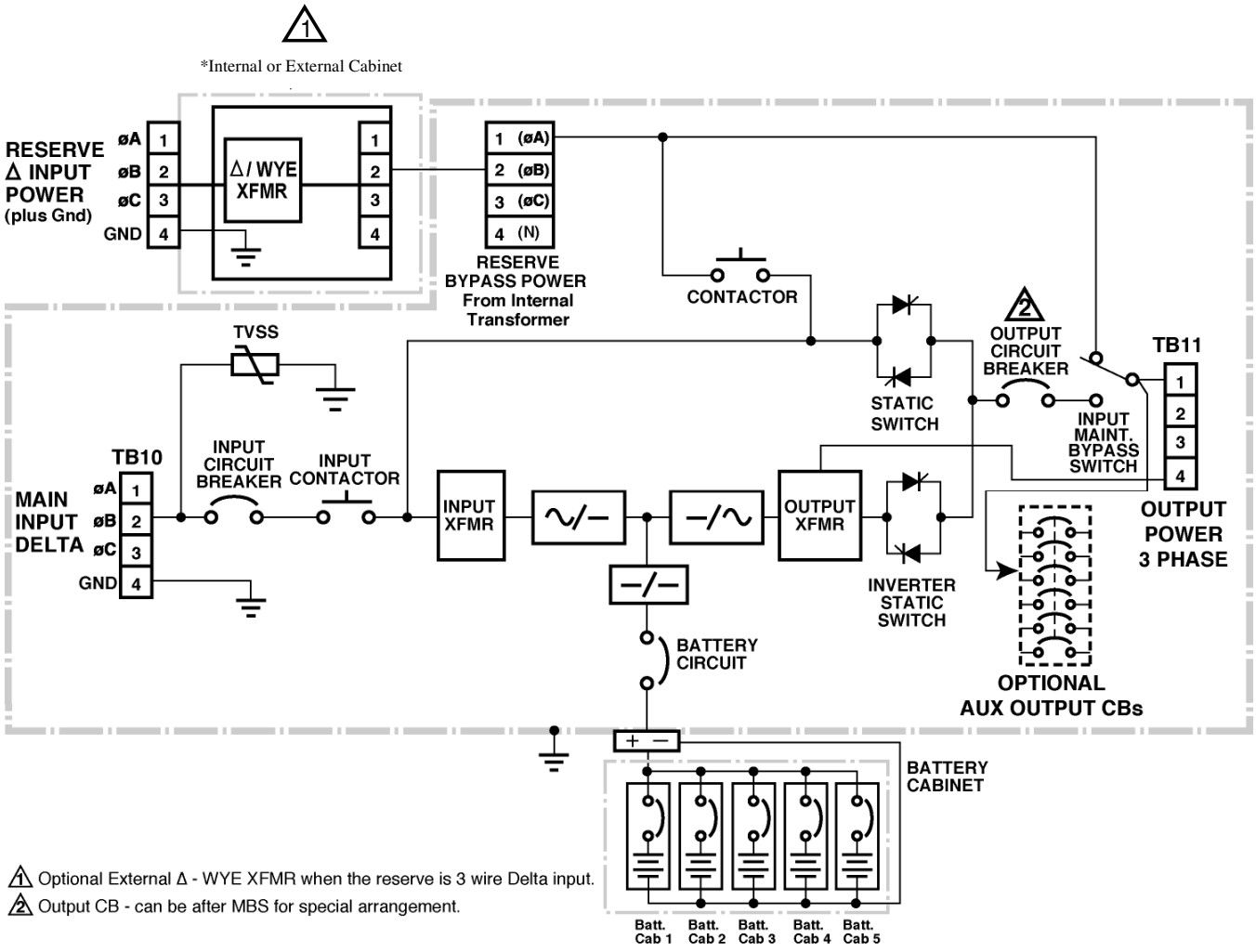


ILLUSTRATION 2-6: FUNCTIONAL BLOCK DIAGRAM FOR DUAL WYE INPUT POWER

2.5 THEORY OF OPERATION

The Power Wave 3 utilizes on-board microprocessor that continuously monitor, control and display all functions (measurement, alarm, alert, and system status) in real time by utilizing high frequency digital signal processing; a reliable and user friendly battery back up system.

2.5.1 Standby Mode

After power is applied, the system is placed in the STANDBY mode and a self-check starts. During this period, the start-up subroutine program checks for input voltage and proper operation of the inverter and bypass SCR's. After the sub-routine is completed and the system is confirmed OK, the system goes into the NORMAL mode.

2.5.2 Normal Mode

The input contactor K1 receives a closing signal, connecting input power to the input transformer. The rectifier supplies DC power to the battery charger, Control Board and the DC/AC inverter circuit. The battery charger is then activated allowing the batteries to be continuously charged. The on-line DC/AC inverter converts the DC voltage to a (PWM) Pulse-Width-Modulation waveform. This waveform is filtered and reconstructed to a desired AC output by using high frequency digital signal processing.

2.5.3 Response To Input Power Abnormal Condition

If the system controller senses an input frequency change of more than $\pm$3 Hz or an out of range input voltage, it will consider it an input malfunction and immediately open the input contactor, isolating the unit from the facility power. At the same time, the charger is turned off and the battery bank becomes a DC supply source to the inverter circuit, maintaining an uninterrupted AC supply to the protected load. The LCD screen will display a "UNIT PROBLEM /ALARM" message. When the facility power returns, stabilizes and is in phase with the backup power, the system controller closes the input contactor and the system returns to normal. If the battery voltage drops below useable voltage and the facility power remains off, the system will assume a standby mode, and will only resume normal operation upon restoration utility power.

2.5.4 UNIT MESSAGES

The System controller will issue a "Failure/ Alert" message on the LCD screen if any of the following conditions happen during the power outage:

- Internal malfunction
- System overheats.
- DC bus Overvoltage/Undervoltage

During a malfunction the system stops its backup operation, inverter SCRs are switched OFF and bypass SCRs are switched ON without any interruption to the load. A summary alarm 5-volt signal is sent to the hardwired interface. The system remains in this mode until power is cycled or the system has been repaired if needed.

2.5.5 Unit "Problem/Alarm" Message

The System controller will issue a unit problem/alarm message on the LCD screen if any of the following conditions occur:

- Input power abnormality
- Battery bank under voltage
- Charger OFF
- Output overload

During a Problem/Alarm mode, inverter IGBTs remain on and an alarm signal may be sent to the signal interface. The system will reset itself as soon as the problem/alarm has been cleared.

2.6 OUTPUT LOADS

The Power Wave 3 is designed to power any fluorescent or incandescent, HID lighting. There are, however, certain types of loads that exhibit an excessive inrush current when first turned on or at other times during operation. Please check load requirements for proper sizing of the system.

SECTION 3 – OPERATION

3.1 START-UP PROCEDURES

The unit's batteries are shipped directly from battery the manufacturer to insure brand new batteries and allow an opportunity for the installing contractor to schedule their arrival when they are ready to commission the system. The battery cabinet and the interconnect cables are shipped with the electronics section of the inverter in a cardboard box located inside each battery cabinet.

OnLine Power service personnel must perform initial start-up or a factory trained authorized representative. To request start-up, fax a completed Request Turn-On form (6002-1545) to 323-721-3929 or e-mail it to info@800pwrsrvc.com. Form is now available in the web at www.800pwrsrvc.com.

The start-up procedure described in this manual is a reference only to a start up of the Power Wave 3 for maintenance and shutdown.

Please be sure not to start up the unit without the assistance of a factory trained, authorize personal as failure to do so may damage the unit and void the unit warrantee.

3.1.1 Verify that the main input circuit breaker, battery breaker and output circuit breaker(s) are in the ”OFF” or ”down” positions. Refer to illustration 2-2 for the location of the circuit breakers.

3.1.2 Check that all cable connections are firmly secured.

Caution **If during the start-up procedures anything unusual occurs, immediately turn off the input circuit breaker and contact OnLine Power at (800) 797-7782 for technical assistance. Also, use this number for any other questions or additional information.**

Caution **The main input power and reserve input power should be available at the same time when dual input power sources are used.**

4.1.3 Apply input power to the Power Wave.

- Input Circuit Breaker remains open.
- Verify that the voltage measured on the input circuit breaker is 208V or 480 VAC and is the same as the nameplate voltage rating. If the voltage is not the same as on nameplate within +10% to -15% tolerance, do not proceed any further. Contact OnLine Power at (800) 797-7782 for technical assistance.
- Verify that there are no voltages measured on the output terminal block.

3.1.4 Turn on the main input circuit breaker.

3.1.5 After turning on the system wait one (1) minute while the Power Wave runs through its internal diagnostic sub routine.

- Hear the sound of contactor closing.
- Observe the fan(s) running.
- Observe the LCD display screen showing unit normal message.

Line 1	UPS NORMAL @ 15 kVA
Line 2	INPUT OK @ CHRG ON
Line 3	BATTERY OK @ DC OK
Line 4	ON INVERTER @ OUT OK

- Verify that the LCD display panel indicates all correct parameters - see Appendix D for details.
- Verify that the output voltage is 120/208/277/480 VAC per the nameplate.

3.1.6 Close battery breaker in the unit cabinet [and in battery cabinet(s)].

3.1.7 At this time, the Power Wave should be providing AC line power. If the Power Wave is not operating in the normal mode, turn off the input circuit breaker(s) including the battery circuit breaker(s). Contact OnLine Power at (800) 797-7782 for technical assistance.

3.1.8 Recheck that the output voltage is 208Y/120 or 480Y/277 VAC.

- If the output voltage is approximately the same as the nameplate, turn on the loads.

3.1.9 Verify battery operation and the inverter test switch.

- To place the Power Wave in battery operation (simulate loss of input power), press and hold the yellow Inverter Test Pushbutton. With the pushbutton in the hold position, the Power Wave should be running on its internal batteries.
- Verify that the LCD panel displays is as below, where “xx” is the kVA of this unit:

Line 1	UPS NORMAL @ xx kVA
Line 2	INPUT BAD @ CHRGR ON
Line 3	BATTERY OK @ DC OK
Line 4	ON INVERTER @ OUT OK

- Release the yellow Inverter pushbutton and Verify that the LCD PANEL displays “INPUT OK @ CHRGR OFF”.

Caution **Be sure to release the Push button, after the test, so it will not deplete the batteries.**

3.1.10 The Power Wave is now fully functional - providing clean, sine wave power to the load with battery back up in case of an input power malfunction.

This concludes the start-up procedures. Please be sure the load as balance as possible on each phase.

3.2 OPERATION

3.2.1 Turning On the Power Wave 3

1) Apply input power.
2) With input power available, turn on the main input circuit breaker.
3) Wait untill you hear the input contactor closing and fan running.
4) Close the battery circuit breaker, only after the LCD display is lit and display screen is per Appendix C.
5) Verify that all parameters on the LCD display panel are correct. See Appendix C for display details.
6) Close the output circuit breaker.
7) Turn On the auxilery output circuit breakers.
8) Verify that the load is as balanced as posiible on all 3 phases.
9) Check to be sure you are not overloading any phase (see max current on the name plate).

3.2.2 Turning Off the Power Wave 3

Turn off the Output Breaker(s), Battery Breaker, and Input Breaker.

3.3 FIELD REPLACEABLE UNITS (FRUS)

Refer to Table 3-1 for ordering replacement parts from the factory. Supply the information from the unit's nameplate, including the serial number, model number, kVA, P.F., input/output battery voltages, and date of manufacture, when ordering parts from the factory. Call Toll Free (800) PWR-SRVC in North America. Replacement parts must be replaced by qualified factory trained service personnel only.

Circuit boards and IGBTs contain ESDS (Electro**S**tatic **D**ischarge **S**usceptable**) components. Handle and package ESDS devices in accordance with JEDEC standard JESD625-A. Use a grounded ESD wrist strap when handling the devices and circuit boards. Always package components and circuit boards in static-dissipative plastic bags before transporting even if a device has failed. Fauilure to do so could result in further damage, complicating repair and malfunction analysis.**

3.3.1 Control Board

The Control Board is located on the inside right door at the top and mounted at 4 corners with screws and washers. Verify that all connectors are matches with their designations and pins #1, 2, etc. Unplug P1 through P15, install the new board, and reconnect all plugs and connections maintaining them with their original orientations.

3.3.2 All Other Parts

Verify that the cables are marked before disconnecting. Replace the defective part with the new part. Reconnect wiring the same way as it was disconnected.

3.3.3 Heat Sink Assembly Replacement Procedure (40 KVA and lower)

1) Disconnect and isolate all sources of power.
2) The Heat Sink Assembly is located on the right side of the top electronic shelf, inside the unit cabinet (Illustration 3-1). Verify that all cables and connectors have labels and are identified as shown. This is important for reinstalling the assembly.
3) Disconnect connectors P7, P6, P4 and P1 from the PCB, A1, which is mounted horizontally on the heat sink.
4) Disconnect 11 power cables at TB4-1 through TB4-7B using a slot blade screw driver. Verify and install identificaton labels for each cable before disconnecting.
5) Loosen 3 Phillips head screws at the front thant hold the heat sink bracket. Pull the complete assembly forward and up, removeing gentlyfrom the tray while making sure that no cables or wires are catching (See illustration 3-1).
6) Install the new assembly in the reverse order. Note that the rear bracket attached to the heat sink slides under the bracket secured on to the back panel. Slide the assembly back and reinstall 3 Phillips screws.
7) Reinstall all the cables and connectors in the reverse order. Verify per illustration 3-1.
8) Verify connections prior to starting up the unit.

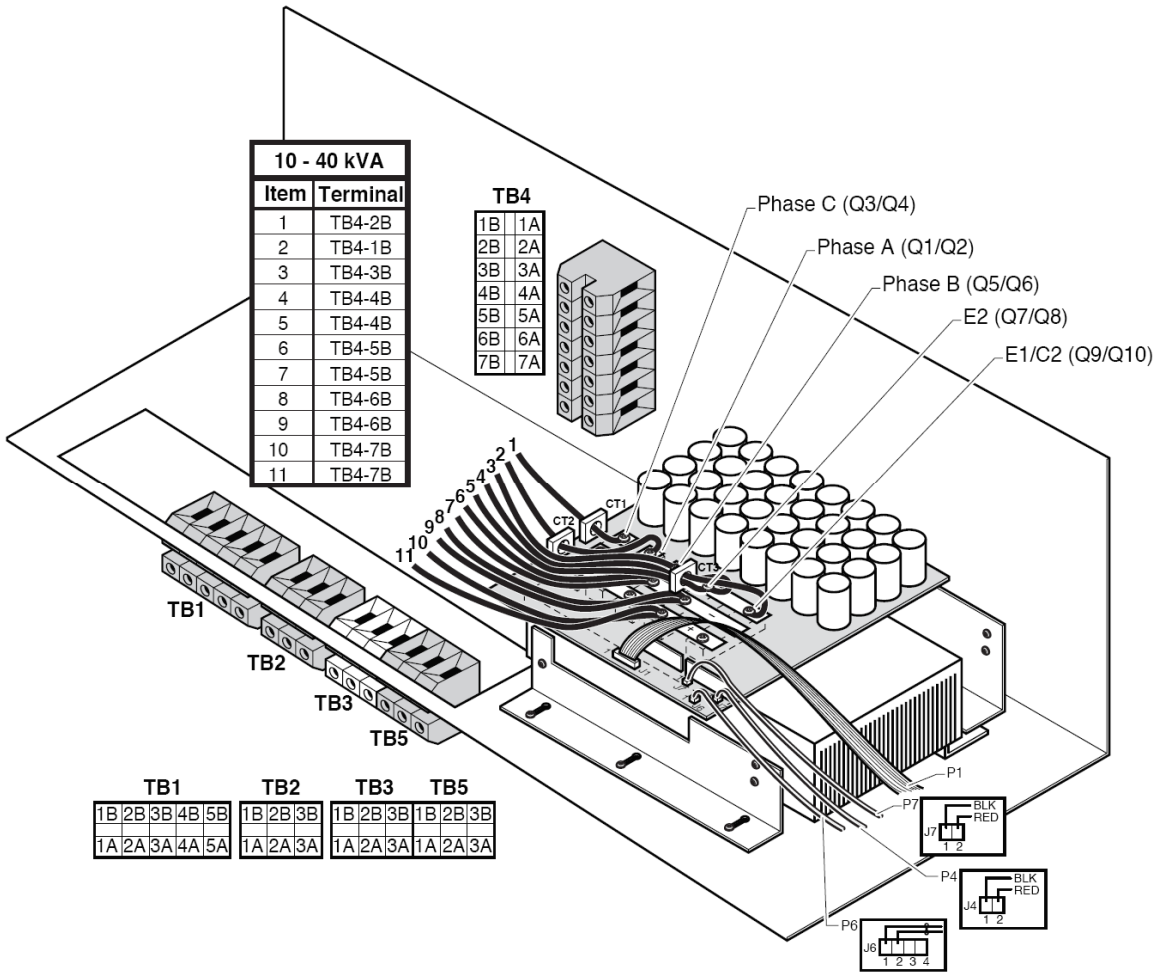


ILLUSTRATION 3-1: 40 KVA AND LOWER, HEAT SINK ASSEMBLY (FRU)

3.3.4 Heat Sink Assembly Replacement Procedure (50 KVA and up)

1) Disconnect and isolate all sources of power.
2) The Heat Sink Assembly is located on the right side of the top electronic shelf, inside the unit cabinet (Illustration 3-2). Verify that all cables and connectors have labels and are identified as shown. This is important for reinstalling the assembly.
3) Disconnect connectors P7, P6, P4 and P1 from the PCB, A1, which is mounted horizontally on the heat sink.
4) Disconnect 11 power cables at TB4-2 through TB4-4, TB5-1, TB5-2 and TB3-2 using a slot blade screw driver. Verify and install identificaton labels for each cable before disconnecting.
5) Loosen 3 Phillips head screws at the front thant hold the heat sink bracket. Pull the complete assembly forward and up, removeing gentlyfrom the tray while making sure that no cables or wires are catching (See illustration 3-2).
6) Install the new assembly in the reverse order. Note that the rear bracket attached to the heat sink slides under the bracket secured on to the back panel. Slide the assembly back and reinstall 3 Phillips screws.
7) Reinstall all the cables and connectors in the reverse order. Verify per illustration 3-2.
8) Verify connections prior to starting up the unit.

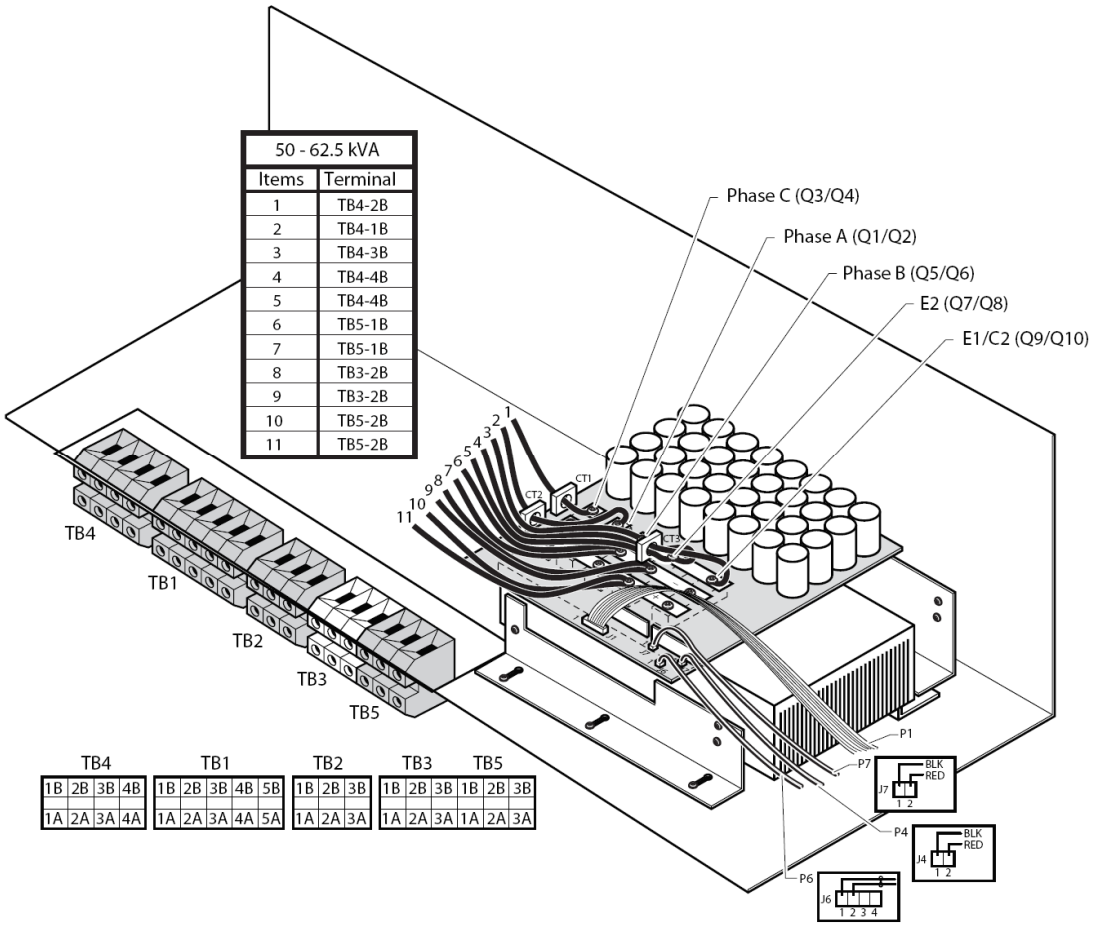


ILLUSTRATION 3-2: 50 KVA AND UP, HEAT SINK ASSEMBLY (FRU)

3.4 REPLACEABLE PARTS LIST

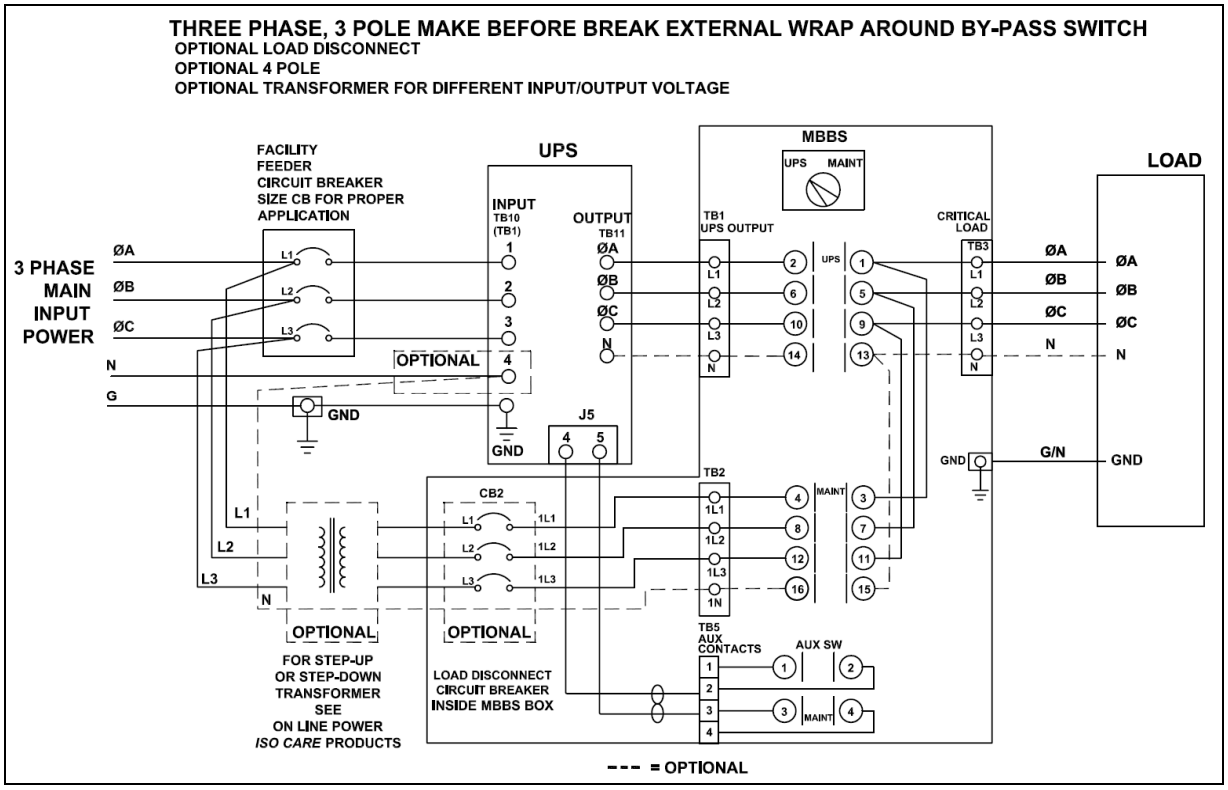
ITEM	QTY	DESCRIPTION	DESIGN
1	1	Bypass Static Switch	PB1, PB3, PB5
2	1	Output Static Switch	PB2, PB4, PB6
3	1	Control Board	A2
4	1	LCD Display Board	A5
5	1	Input Contactor	K1
6	1	SCR Driver	
7	1	Control Power Transformer	T2
8	1	Control Transformer Fuse	F4.5
9	1	Fan Fuse	F11-14
10	1	Heat Sink Assembly	HS1
11	1	Fan(s)	B1~9

SECTION 4 – SYSTEM OPTIONS

This section describes options available for the Power Wave 3-phase. The following options are available:

Part Number	Options
3000-044 thru -048 and -055 thru -057	External Manual Bypass Switch
9100-1363-02	Audio Alarms with Silence Switch
9100-1020-04	Remote unit Status Display, 3 Phase Monitor
9100-1362-02	Form “C” N/O Contacts for Alarms
9100-1440-01	TVSS (Transient Voltage Surge Suppressor), 208V
9100-1440-011	TVSS (Transient Voltage Surge Suppressor), 480V
9100-1343-01 thru -26	Normally ON/OFF Output Aux. Circuit Breakers
9100-1439-01 thru -03, -11 thru -13	External Output Aux. Circuit Breakers in Panel Board
9100-1372-01-03	10% Input Current Harmonic Filter
9100-1373-01-04	5% Input Current Harmonic Filter
See page 4-9	Higher KAIC Norm .ON/OFF Output Circuit Breaker 3 Phase
9100-1445-01 thru -05	EMI Filters
9100-1446-01 thru -03	Dual Input System WYE/WYE
9100-1446-04 thru -06	Dual Input System DELTA/WYE
See page 4-10	Dual Input System DELTA/DELTA
9100-1317-02	Seismic Mounting Bracket (Left and Right set per cabinet)
	GMS (Global Monitoring System)
9800-003-25 thru -150	Local on PC - via RS232
9800-004-150 thru -1000	Local on PC - via RS485
9100-1468-02	Remote - Dial-Up with WEB, data logger
9100-1501	ECC - EMERGENCY CIRCUIT CONVERTER
9100-1502	ECM - EMERGENCY CONTROL MODULE

4.1 Optional External Maintenance Bypass Switch – P/N 3000-044 thru –056 (Typical)



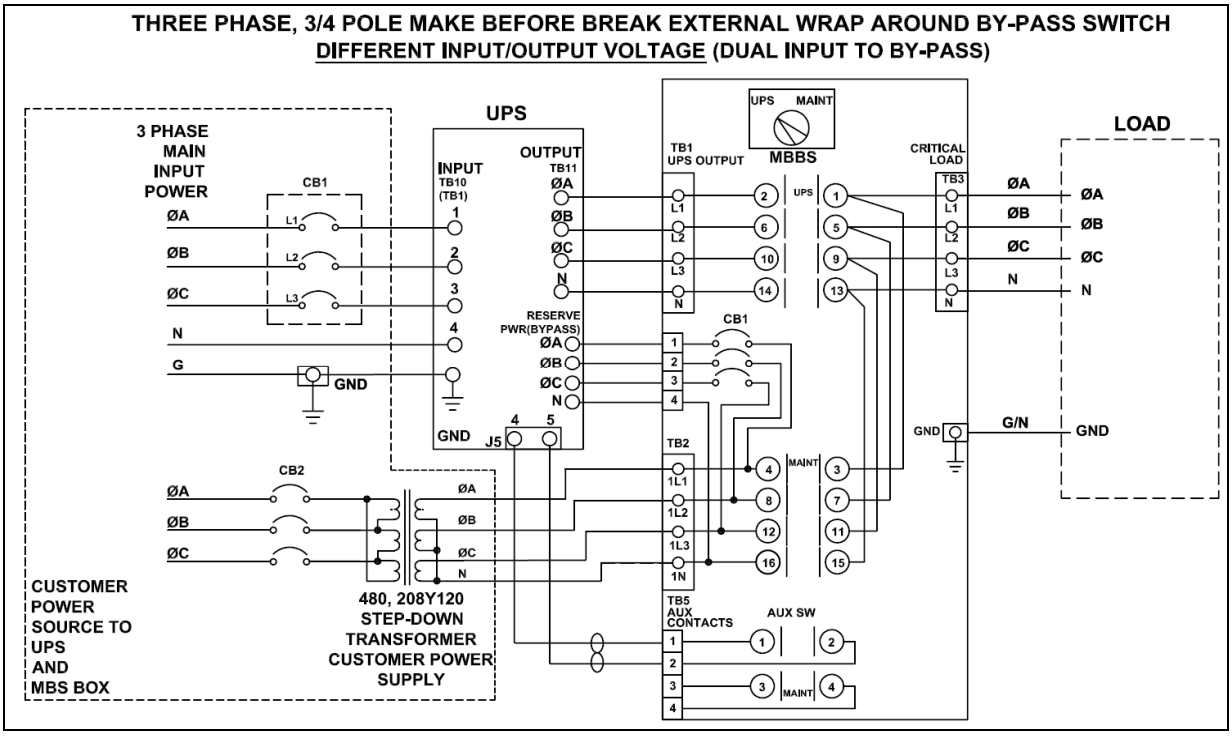


ILLUSTRATION 4-1: EXTERNAL MAINTENANCE BYPASS SWITCH DIAGRAM

Notes for Illustration 4-1.

1) Switch contacts are 3-phase L-L (Line to Line) 3-pole and optional L-N (Line to Neutral) 4-pole "make before-break".

2) When the switch is in "UPS" position, the critical load is being powered through the inverter (with battery backup available).

3) When the switch is in "MAINT" position, the critical load is being powered through the input utility or input transformer for different voltage with no battery backup available.

4) The wrap around By-pass SW switch should be used with the same input/output voltage.

5) For different input/output voltages, the switch should be used with an external transformer.

6) The wrap around By-pass SW switch cannot be used with any built in distribution secondary auxiliary circuit Breakers.

4.1.1 Installation

Allow front access to the MBS box at all times for maintenance and servicing. Electrical codes require that the MBS box be installed with no less than 3 feet at the front of the cabinet. Side and rear panels do not require service clearance, however side vents must not be blocked.

Danger!

ALL POWER CONNECTIONS MUST BE MADE BY A LICENSED ELECTRICIAN WHO IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DEATH, INJURY, EXPLOSION, FIRE OR DAMAGE TO THE EQUIPMENT. VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

Refer to Section 6.1, Site Planning and Preparation

Verify the following connections have been made per wiring diagrams.

Wiring Inspection:

1) Verify all power connections are tight.
2) Verify all control wire terminations are tight.
3) Verify all power wires and connections have proper spacing between exposed surfaces, phase-to-phase and phase-to ground.
4) Verify that all control wires are run in individual, separate steel conduit.

4.1.2 Operation

The external maintenance bypass switch is mounted in a box which is field installed on adjacent wall or on the side of the unit cabinet (be sure not to block airflow). This box includes a rotary switch to provide a single control for transferring to and from the utility.

The operator control switch for external manual bypass can be accessed by opening the cabinet's front door.

Caution

A single control simplifies the operation of the external manual bypass switch, however operating instructions must be carefully observed before using the bypass switch. Using the improper sequence in operation of the bypass switch SW-1 and toggle switch S-1 (when present) could result in unwanted results.

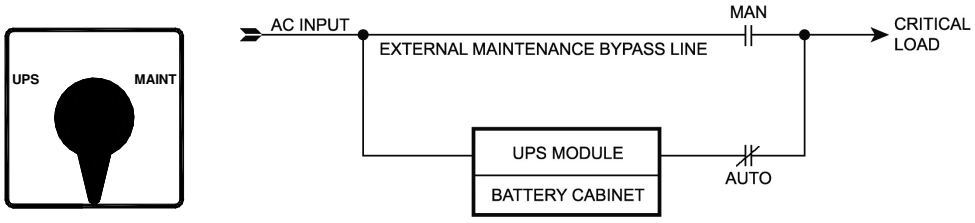


ILLUSTRATION 4-2: MAINTENANCE BYPASS SWITCH

The Switch Positions are:

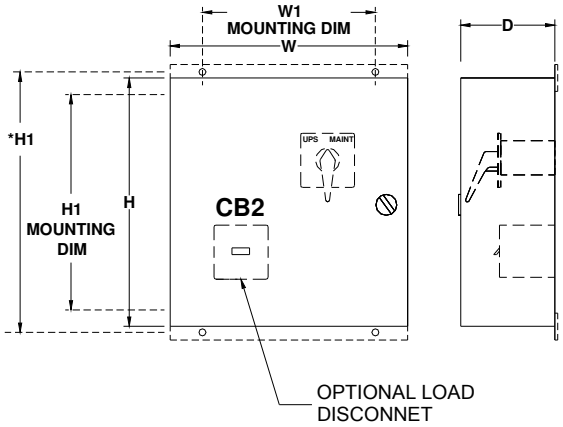
1) "MAINT" – Connects power to the critical load through the external maintenance bypass line. The unit needs to be de-energized for maintenance purposes.
2) "UPS" – Connects the critical load to the output of the unit and establishes normal operation.

NOTE:

1. The middle position of the switch, when present is not designed for operating the unit. If the switch is left in the middle position, there will be no output power when the invert is off.
2. Switch contacts are 3-phase (L-L) Line to Line 3-pole & optional (L-N) Line to Neutral 4-pole " make before- break
3. The wrap around by-pass switch should be used with the same input/output voltage.
4. For different input/output should be used with external transformer.
5. Wrap around by-pass switch should not be used with any built in distribution secondary auxilary circuit breakers.

4.1.3 Specification. Optional External Manual Bypass Switch

Three phase 3 and 4 pole Make Before Break External Wrap Around By Pass Switch PART NO SELECTION CHART									
3 Pole	KVA	VOLTAGE I/O	PART NO	VOLTAGE I/O	PART NO	*VOLTAGE I/O	PART NO	*VOLTAGE I/O	TYPE
	10	208/208	3000-044	480/480	3000-044	480/208	3000-044	208/480	3000-044
	15	"	3000-044	"	3000-044	"	3000-044	"	3000-044
	20	"	3000-045	"	3000-044	"	3000-045	"	3000-044
	25	"	3000-045	"	3000-044	"	3000-045	"	3000-044
	30	"	3000-046	"	3000-044	"	3000-046	"	3000-044
	40	"	3000-046	"	3000-044	"	3000-046	"	3000-044
	50	"	3000-047	"	3000-045	"	3000-047	"	3000-045
	50 KW	"	3000-047	"	3000-045	"	3000-047	"	3000-045
4 Pole	KVA	VOLTAGE I/O	PART NO	VOLTAGE I/O	PART NO	*VOLTAGE I/O	PART NO	*VOLTAGE I/O	TYPE
	10	208/208	3000-050	480/480	3000-050	480/208	3000-050	208/480	3000-050
	15	"	3000-050	"	3000-050	"	3000-050	"	3000-050
	20	"	3000-055	"	3000-050	"	3000-055	"	3000-050
	25	"	3000-055	"	3000-050	"	3000-055	"	3000-050
	30	"	3000-056	"	3000-050	"	3000-056	"	3000-050
	40	"	3000-056	"	3000-050	"	3000-056	"	3000-050
	50	"	3000-057	"	3000-055	"	3000-057	"	3000-055
	50 KW	"	3000-057	"	3000-055	"	3000-057	"	3000-055
For load disconnect option add "-B" suffix to the part no: 3000-044-B ***Unit with different input/output voltage require step up or down transformer**									



SWITCH RATING	Part No.	DIM'S "INCH"				
		W	H	D	W1	H1
55 AMP	3000-044, -044-B, -050, -050-B	14	16	8	*12	*16.75
110 AMP	3000-045, -045-B, -055, -055-B	14	16	10	*12	*16.75
175 AMP	3000-046, -046-B, -056, -056-B	20	20	10	18.50	18.50
240 AMP	3000-047, -047-B, -057, -057-B	24	24	10	22.50	22.50

ENCLOSURE DIM'S

4.2 OPTIONAL AUDIO ALARM WITH SILENCE SWITCH – P/N 9100-1363-02

4.3 OPTIONAL REMOTE UPS STATUS PANEL - P/N 9100-1020-07

4.3.1 Installation

The Remote UPS Status Panel is available in a wall mount or console style box in black finish. Up to 500 feet long cable option.

4.3.2 Operation

The Remote Status Panel may come with 5 LED's, HORN, TEST SWITCH, and SILENCE SWITCH. Status LED's are as follow:

- **INVERTER ON**
- **LOW BATT**
- **INPUT FAIL**
- **ON BYPASS**
- **SUMMARY ALARM**

Note: In some units it might require 120VAC Power

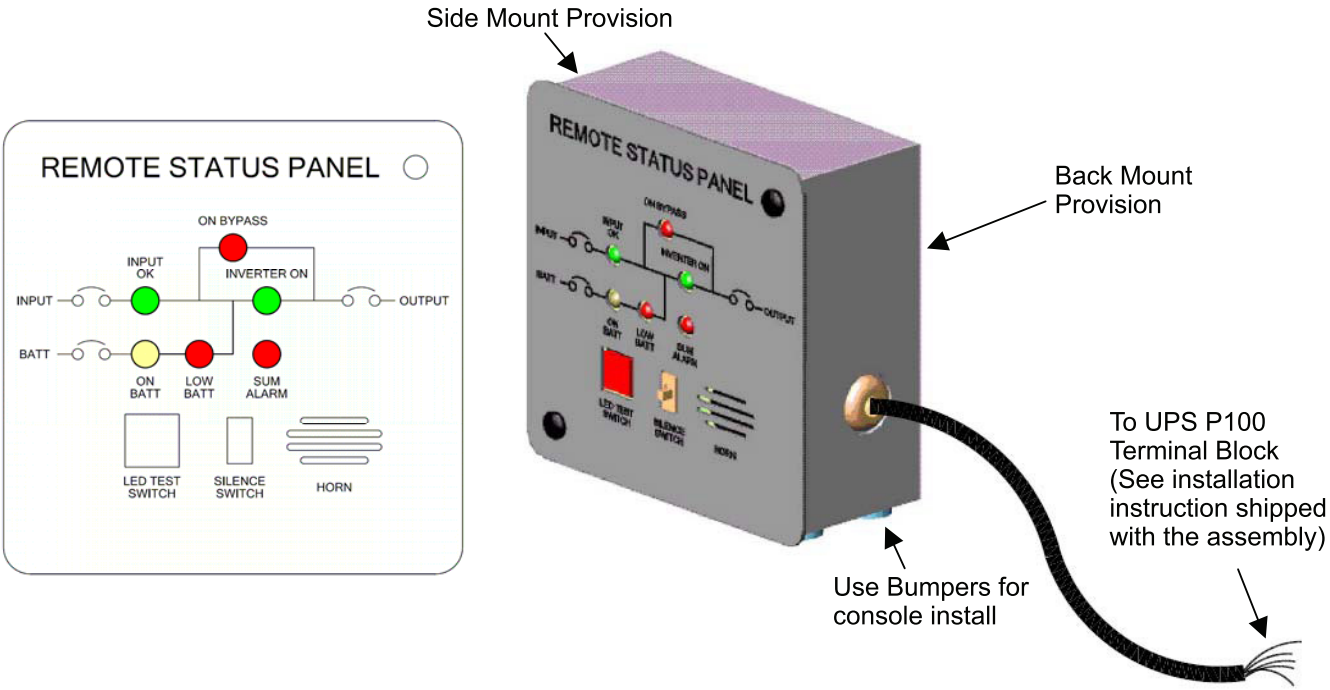


ILLUSTRATION 4-2-1: REMOTE STATUS PANEL

4.4 OPTIONAL FORM "C" CONTACTS FOR ALARMS – P/N 9100-1362-02

4.4.1 Installation

Terminal strip TB is provided on the optional alarm relay board for user connection to the individual alarm contacts.

4.4.2 Operation

The Remote Contact Board includes isolated Form C contacts for the following alarm signals:

TB-1	LOW BATTERY
TB-2	ON BYPASS
TB-3	SUMMARY ALARM
TB-4	NOT USED
TB-5	INPUT FAIL
TB-6	COMMON

4.5 OPTIONAL TVSS P/N – 9100-1440-01

4.5.1 Operation

The TVSS contains energy absorbing components designed for specific line configurations. The device has two-stage protection. When protection components are damaged by absorbed transients, the device will show a reserve flag indicating a need for replacement. At this time the device is still operational, due to redundant circuits. After the second spike, the device will show and alarm condition indicating replacement is mandatory. Remote indication contacts "TS" allows remote control of the protection status.

4.5.2 Specifications

Part Number	Description
9100-1440-01	TVSS OPTION. 208V, 3-PHASE, 40KVA 8/20U, REPLACEABLE DIN RAIL, ALARM INDICATOR, AND INTERNAL DISCONNECTOR. IEC61643-1 / EN61643-11 ANSI / IEEE C62.41 / UL1449, Second Edition –Feb.2007 CULUS / UL94-V2 3-PHASE PLUS NEUTRAL
9100-1440-11	TVSS OPTION, 480V, 3-PHASE, REPLACEABLE DIN RAIL, ALARM INDICATOR, AND INTERNAL DISCONNECTOR. IEC61643-1 / EN61643-11 ANSI / IEEE C62.41 / UL1449, Second Edition –Feb.2007 CULUS / UL94-V2 3-PHASE PLUS NEUTRAL.

4.6 OPTIONAL NORMALLY ON/ NORMALLY OFF OUTPUT AUX. CIRCUIT BREAKERS – P/N 9100-1343-01 THRU -16 ~ -26

These circuit breakers are 1 pole, 20 amp devices for protection of customer's circuits.

Normally ON C.B. Option

Normally OFF C.B. Option

Normally OFF Delay C.B. Option

4.7 EXTERNAL OUTPUT AUX CIRCUIT BREAKER (LOAD CENTER) WITH LOCKABLE ENCLOSURE.

4.7.1 Description

A lockable (unique) external interior load center with single pole of three pole auxiliary circuit breaker is provided for power distribution from the unit output to critical loads. The panel board (24,30, or 42 pole) can be used for customer selected ampacity QO breaker(s) up to 42 breakers. See drawing below for panel mounting arrangement.

4.7.2 Specification

Part Number	Description	Rating	Max # Poles	DIM "A"	DIM "B"	DIM "C"	LOAD CENTER		
							WD	DP	HT
9100-1439-01	Load center (QO Breaker)	208Y/120	24	16.5	45	34	14.5	4	21
9100-1439-02	Load center (QO Breaker)	208Y/120	30	16.5	45	38	14.5	4	30
9100-1439-03	Load center (QO Breaker)	208Y/120	42	16.5	45	43	14.5	4	38
9100-1439-11	Load center (EDB Breaker)	480Y/120	18	20	46	36	20	5.25	26
9100-1439-12	Load center (EDB Breaker)	480Y/120	30	20	46	39	20	5.25	32
9100-1439-13	Load center (EDB Breaker)	480Y/120	42	20	46	56	20	5.25	44

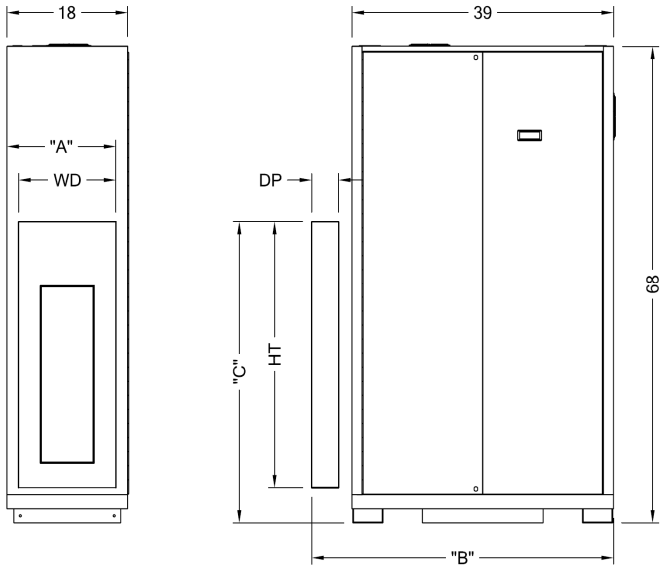


ILLUSTRATION 4-3: UPS WITH EXTERNAL LOAD CENTER

NOTE: Customer to specify single pole or three pole (QO or EDB type SQ-D breaker) with appropriate ampacity to maximum pole position of the load center.

When utilizing secondary auxiliary breakers, be assure that each phase is loaded no more than 33% of unit capacity.

Load balancing within 10% is recommended.

4.8 OPTIONAL 10% INPUT CURRENT HARMONIC FILTER – P/N 9100-1372-01-03

add approximately 300 lbs to system weight)

Part Number	Description
9100-1372-01	10% INPUT CURRENT HARMONICS FILTER USE FOR 10/15/25KVA
9100-1372-02	10% INPUT CURRENT HARMONICS FILTER USE FOR 25KVA
9100-1372-03	10% INPUT CURRENT HARMONICS FILTER USE FOR 30/40 KVA.

4.9 OPTIONAL 5% INPUT CURRENT HARMONICS FILTER P/N 9100-1373-01-04

(add approximately 400 lbs to system weight)

Part Number	Description
9100-1373-01	5% INPUT CURRENT HARMONICS FILTER USE FOR 10/15/20KVA
9100-1373-02	5% INPUT CURRENT HARMONICS FILTER USE FOR 25KVA
9100-1373-03	5% INPUT CURRENT HARMONICS FILTER USE FOR 30/40KVA
9100-1373-04	5% INPUT CURRENT HARMONICS FILTER USE FOR 50KVA

4.10 OPTIONAL EMI FILTER – P/N 9100-1445-1 THRU -05

EMI FILTER EN55022, 1998 CLASS "B" RADIATED EMISSION EN55022, 1998 CLASS "B" CONDUCTED EMISSION
FCC PART 15 CLASS "B" RADIATED EMISSION
FCC PART 15 CLASS "B" CONDUCTED EMISSION

Part Number	Description
9100-1445-01	EMI FILTER ASSY. 60AMP, 3-PHASE, UNIT FOR 10KVA/15KVA/20KVA/25KVA/30KVA/480Y/277V.
9100-1445-02	EMI FILTER ASSY. 100AMP, 3-PHASE, UNIT FOR 20KVA/25KVA-208Y/120V; 40KVA/50KVA/50KW—480Y/277V.
9100-1445-03	EMI FILTER ASSY. 150AMP, 3-PHASE, UNIT FOR 30KVA/40KVA-208Y/120V
9100-1445-04	EMI FILTER ASSY. 200AMP, 3-PHASE, UNIT FOR 50KVA-208Y/120V
9100-1445-05	EMI FILTER ASSY. 200AMP, 3-PHASE, UNIT. FOR 50 KW-208Y/120V

4.11 OPTIONAL HIGHER KAIC NORM ON/OFF OUTPUT CIRCUIT BREAKER

4.11.1 Specifications

HIGHER KAIC NORMALLY ON/NORMALLY OFF OUTPUT AUX CBs OPTION, 3-PHASE, 20AMP

Part Number	Description
9100-1434-01~-26	22 KAIC @120/240V, Din Rail
9100-1434-31~56	42 KAIC @120/240V, Din Rail
9100-1434-61~-86	65 KAIC @120/240V ONLY. Din Rail
9100-1435-01~-26	14 KAIC @277V ONLY. Molded Case C.B.
9100-1435-31~56	25 KAIC @ 277V Only
9100-1435-61~-86	65 KAIC @277V ONLY. Molded Case C.B.
9100-1343-01~-26	22 KAIC @120/240V, 10 KAIC 277V . Din Rail (Standard)
9100-1343-41~66	30 KAIC @120//277V, Din Rail

4.12 OPTIONAL DUAL INPUT SYSTEM WYE/WYE – SAME INPUT/OUTPUT VOLTAGE

P/N	Voltage	
9100-1446-01	208V IN/OUT 10/15/20 kVA,	480V IN/OUT 10-50 kVA
9100-1446-02	208V IN/OUT 25/30/40 kVA	
9100-1446-03	208V IN/OUT 50 kVA	

4.13 OPTIONAL DUAL INPUT SYSTEM DELTA/WYE – SAME INPUT/OUTPUT VOLTAGE

P/N	Voltage	
9100-1446-04	208V IN/OUT 10/15/20 kVA,	480V IN/OUT 10-50 kVA
9100-1446-05	208V IN/OUT 25/30/40 kVA	
9100-1446-06	208V IN/OUT 50 kVA	

4.14 OPTIONAL DUAL INPUT SYSTEM DELTA/DELTA –DIFFERENT INPUT/OUTPUT VOLTAGE

4.14.1 Delta Input System 208V IN / 480V OUT Wye-Wye

Use 6.13 and 6.12 Dual Input System and separate Iso-Care Transformer to match the output voltages.

Consult factory for proper kVA and model number

4.15 OPTIONAL SEISMIC MOUNTING BRACKET – P/N 9100-1317-02 (Consult factory for certification)

P/N: 5088-025 Left / Right seismic floor mounting bracket

4.16 OPTIONAL STACKABLE RACK –

Drawings: 6001-032-07 **Refer to Appendix D.**

4.17 Global Monitoring System (GMS)

4.17.1 Local On PC - Via RS 232 - P/N 9800-003 – 25 THRU 150 (25-150ft)

4.17.1.1 Description

This option requires a PC and LabView monitoring software. The software is provided on a CD-ROM that is easily installed on any Microsoft Windows platform. An attached cable of a specified length plugs into a PC serial port and connector J6 on the Control PCB 1625-296.
LabView software must be selected for COM port 1.

4.17.1.2 Operation

LabView software translates data protocol coming to COM port 1 from an active unit via the RS232/RS485 interface and displays the parameters and active alarms on a PC monitor in the appropriate form. Below is a sample of a PC screen with measured parameters and actual unit status.

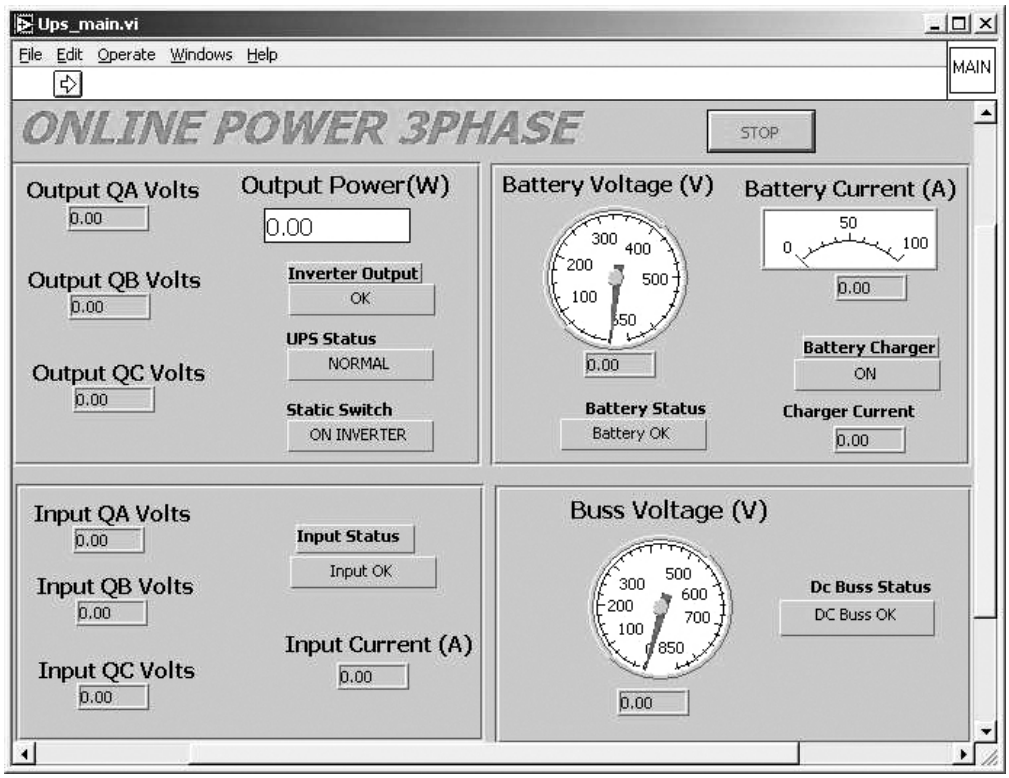


ILLUSTRATION 4-8: SAMPLE PC SCREEN

4.17.1.3 Specification

Description: Local On PC – Via RS 232
Part Number: 9800-03-25 thru 150
PC system requirements: Windows 98 or higher operating system and a serial port.
Viewing software: LabView (included)
RS232 cable: 25 to 150ft, as specified (included)

4.17.2 Local On PC - Via RS 485 - P/N 9800-004-150 thru 1000 (150-1000 ft)

Installation, Operation, Specification as above (except RS 485 cable)

4.17.3 GMS- Remote Dial UP Monitor 2000: p/n 9100-1468-02
Remote Dial Up: Data, Voice, Fax, Pager, PC, E-mail, Event Log, Stats.
For details of all fuctions and operation refer to User's Manual, 6002-1770.

4.17.3.1 Description

Monitor 2000 requires a phone line for remote operation. It comes with an interface PCB, that provides monitor inputs with isolated signals from the unit. The option comes wired and fully functional. For local PC communication, you must connect your computer serial port to the 2000 RS232 data communication port.

ILLUSTRATION 4-9: MONITOR 2000 FRONT VIEW

The Manager 2000 Windows Setup Program makes installation quick and easy. Pictured below is an actual Manager 2000 screen.

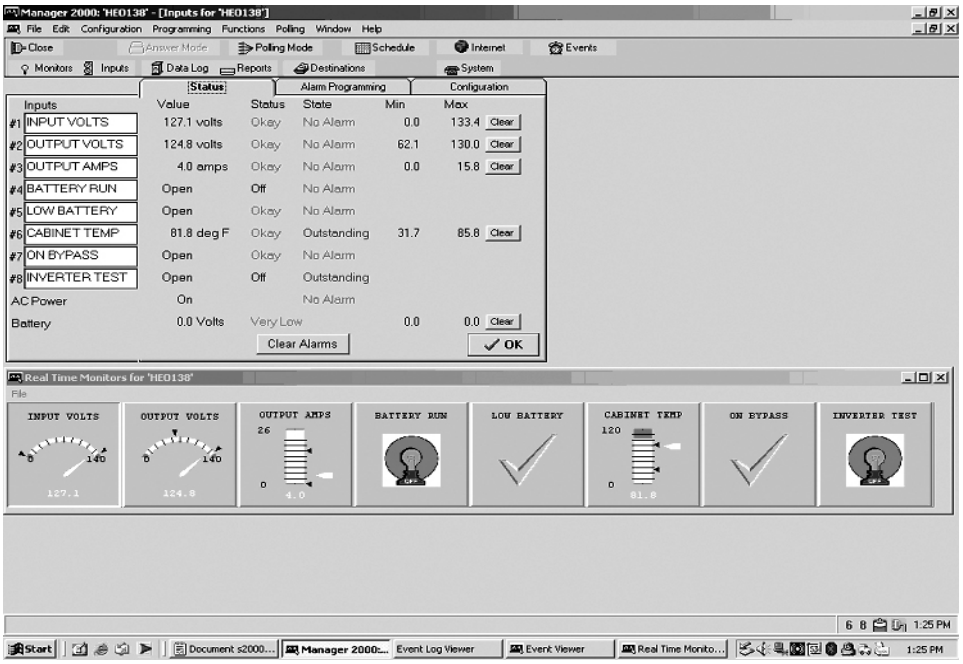

Manager 2000: 'HEO138' - [Inputs for 'HEO138']
File Edit Configuration Programming Functions Polling Window Help
Close Answer Mode Polling Mode Schedule Internet Events
Monitors Inputs Data Log Reports Destinations System
Status Alarm Programming Configuration
Inputs Value Status State Min Max
#1 INPUT VOLTS 127.1 volts Okay No Alarm 0.0 133.4 Clear
#2 OUTPUT VOLTS 124.8 volts Okay No Alarm 62.1 130.0 Clear
#3 OUTPUT AMPS 4.0 amps Okay No Alarm 0.0 15.8 Clear
#4 BATTERY RUN Open Off No Alarm
#5 LOW BATTERY Open Okay No Alarm
#6 CABINET TEMP 81.8 deg F Okay Outstanding 31.7 85.8 Clear
#7 ON BYPASS Open Okay No Alarm
#8 INVERTER TEST Open Off Outstanding
AC Power On No Alarm
Battery 0.0 Volts Very Low 0.0 0.0 Clear
Clear Alarms
OK
Real Time Monitors for 'HEO138'
File
INPUT VOLTS
OUTPUT VOLTS
OUTPUT AMPS
BATTERY RUN
LOW BATTERY
CABINET TEMP
ON BYPASS
INVERTER TEST
Start
Document s2000...
Manager 2000:...
Event Log Viewer
Event Viewer
Real Time Monito...
1:25 PM

ILLUSTRATION 4-10: MANAGER 2000 SCREEN

4.17.3.2 Operation

The dial-up Monitor 2000 measures and monitors the following set of parameters and status contacts.

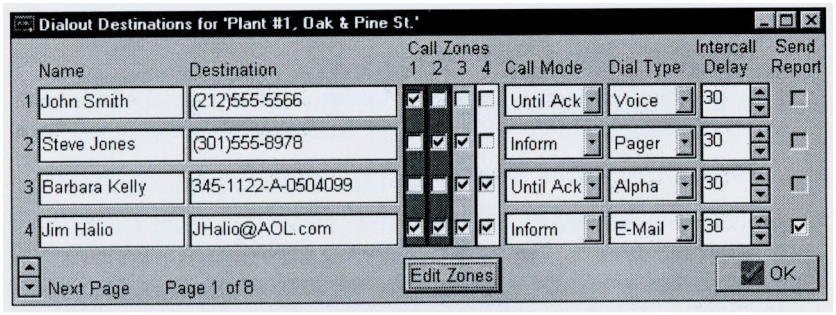
1. Input Volts
2. Output Volts
3. Output AMPS
4. Battery run
5. Low battery
6. Cabinet temperature (ºF)
7. On by-pass
8. Summary alarm

The user can monitor all inputs in real time graphical form and can access real time input monitoring from the tool bar button labeled monitors.
The details are given in the GMS 2000 user's Manual (6002-1770).

4.17.3.3 Alarms

When an alarm occurs, the unit will dial out and send a message to all programmed destinations. GMS 2000 will call up to 32 telephone numbers or email addresses (both referred to as destinations) to report alarm conditions or send reports.

Destinations can be voice calls, fax machines, computers with modems running GMS 2000 software, e-mail addresses, numeric pagers or alphanumeric pagers. You must be on line with the unit to program the destination parameters. Once you are online, choose "Program" from the main menu, then select "Destinations". You can also access the destination programming from the toolbar button labeled "Destinations".


Dialout Destinations for 'Plant #1, Oak & Pine St.'
Name
Destination
Call Zones 1 2 3 4
Call Mode
Dial Type
Intercall Delay
Send Report
1 John Smith (212)555-5566 Until Ack Voice 30
2 Steve Jones (301)555-8978 Inform Pager 30
3 Barbara Kelly 345-1122-A-0504099 Until Ack Alpha 30
4 Jim Halio JHalio@AOL.com Inform E-Mail 30
Next Page
Page 1 of 8
Edit Zones
OK

Dialout Destinations Form

The Dialout Destinations form allows you to program information for up to 32 destinations. The parameters and their options are listed below.

Name:

This field allows you to program a description (16 characters maximum) for each destination. The name will appear on faxes and e-mail transmissions whenever an alarm or report is send to a destination. If you are entering a fax destination be sure to use the name of person who you intend to receive the fax.

Destination:

The destination is the actual telephone number or e-mail address the GMS 2000 dials to deliver its report or alarm message. The destination field can be up to 64 characters long for e-mail addresses and 32 digits for all other dial types and may consist of numbers, letters and special dialing codes.

Numeric Pagers:

The GMS 2000 can send alarm messages to numeric pagers. It will automatically send its telephone number and the alarm input number when dialing to a numeric pager. All you have to do is enter the telephone number of your pager.

Example: (301) 565-2300

Note: If your pager service is answered by a voice-promted message you will need to enter additional pro-gramming . See the special dialing codes section iht the GMS 2000 Manual packed with the unit.

Alphanumeric Pagers:

The GMS 2000 can dial alphanumeric pagers to send alarm messages. The GMS 2000 will send the unit description, tele-phone number, input name and input value. To program an alphanumeric pager destination, enter the phone followed by the letter A and then the pager indentification number.

Example: 1-610-555-4593 A 0504099

E-mail:

The GMS 2000 can send alarm messages and reports via email. To use this function, you must designate an e-mail host. You can use your own computer as an email host.

Dial Type:

This is used to specify the type of call GMS 2000 will make to a particular destination. The available dialout types are: Fax, voice, e-mail, pager, alpha pager and modem.

Fax – This instructs GMS 2000 to send a fax transmission to either a fax machine or a PC with the ability to receive a fax directly.

Email – This instructs the GMS 2000 to deliver a message to the E-mail address programmed in the destination field.

Note: For "e-mail" dial types, only e-mail addresses may be programmed in the destination field, NOT telephone numbers. The GMS 2000 will contact an e-mail host as designated on the system screen.

Numeric Pager – This instructs GMS 2000 to dial a numeric pager and leave the unit's Indentification number and alarm input numbers on the display. This will happen automatically just by entering the pager's telephone number in the destination field. If you want to change the information that is identifies your pager or you are having trouble receiving the page, you may use the special dialing codes to customize the signal to your pager.

Alpha Pager – This instructs GMS 2000 to deliver a text message to an alphanumeric pager.

Modem –This instructs GMS 2000 to call a modem attached to a computer running Manager 2000 software. The sofhware must be in "Answer Mode". When the Manager 2000 software receives the alarm call, it will download the unit's event log, execute an alarm query, and display the result on the screen. You may also have the computer print a copy of the alarm event as well as play a recorded message when an alarm is received.

Important: The unit description on your computer must match the unit description stored in your GMS 2000 for Alarm and Report call-in features to work properly.

Intercall Delay:

The intercall delay is the amount of time the MGS 2000 will wait after completing a call before calling the next destination. The delay is in seconds, with a default of 30.

Note: A 30-second delay is too short to allow a call back if a pager is being called. Increase the delay time enough to accommodate your pager.

Alarm Call Mode:

The three selections for destination Alarm Call Mode are Disabled, Until A Acknowledged, and Inform.

Disabled: Destinations programmed with Alarm Call Mode Disabled will never be called. This is simply a way to disable dialing to this destination if necessary.

Until Acknowledged: Destinations programmed with Alarm Call Mode "Until Acknowledged" will continue to be called until one of them acknowledges the alarm. Once acknowledged, the remaining destinations will not be called.

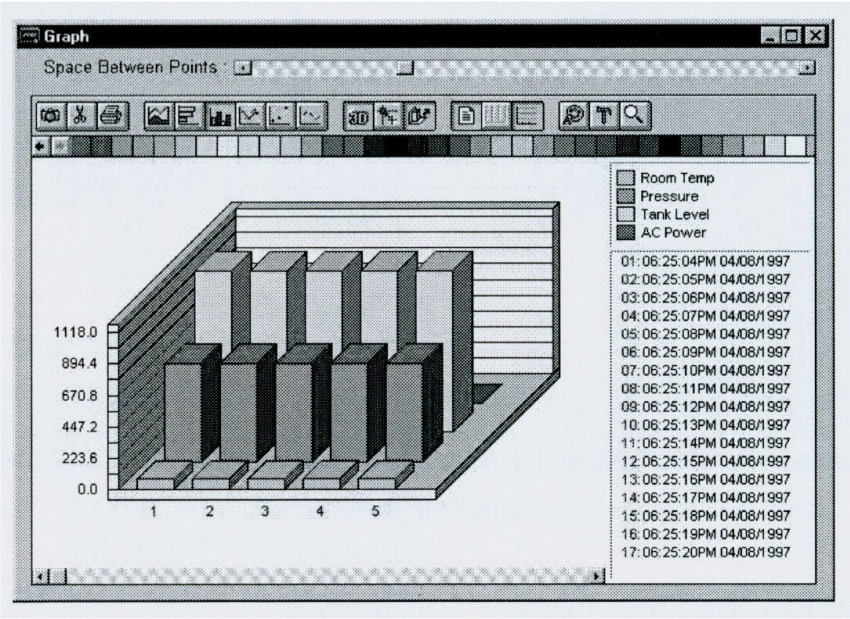
NOTE: Fax, e-mail and modem destinations cannot be programmed as "Until Acknowledged" call modes.

Inform: Destinations programmed with Alarm Call Mode "Inform" will be called until the alarm message has been successfully delivered one time, regardless of acknowledgment. If a transmission to an " Inform" destination was successful, that destination will not be contacted again. GMS 2000 will only make additional attempts to contact an Alarm Call Mode "Inform" destination if that destination hasn not successfully received its transmission; for example, due to a "no answer," busy signal" or "no carrier" response. If a transmission fails to reach a destination after the last calling round is completed, the malfunction is recorded in event Log. Calls to priority "Inform" destinations are useful for providing records of alarm events.

Important: Destinations programmed as Alarm Call Mode "Inform" cannot acknowledge alarms.

4.17.3.4 GRAPH:

Once the data log records have been displayed, they may be viewed in graph form by clicking the "Graph" button. The graph will show all inputs selected in the query. If too many samples are selected for graphing, the software gives you the option to average values. Oherwise, you will have to perform a smaller query to avoid averaging. The graph has many features that allow to display the data graphically, including line graphs, bar charts and three dimensional views. Experimentation is the best way to larn about all of the available options. A sample graph follows.



Sample Graph

PRINT:

Once the Data Log records have been displayed, clicking this button may print them.

EXPORT:

Once the data log records have been displayed, the displayed information may be saved as a comma-delimited file. This file can then be used in a spreadsheet programs such as Lotus 123 or Microsoft Excel.

Send Report:

The GMS 2000 can be programmed to automatically send reports to selected destinations. Check this box to include this destination when sending reports.

Note: Reports may only be sending to fax, e-mail, or modem destinations.

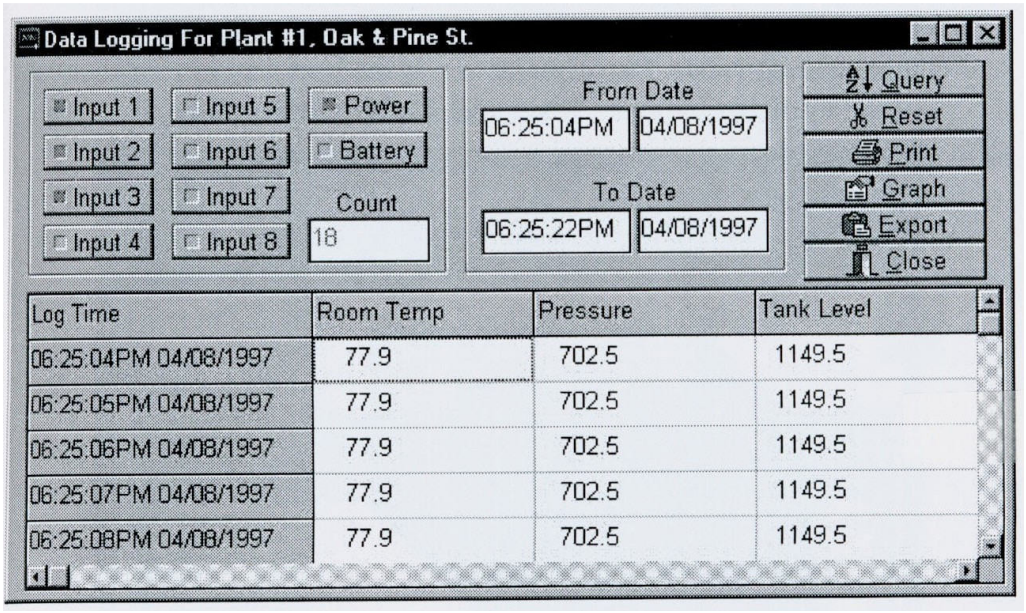
4.17.3.5 DATA LOGGING

The GMS 2000's built-in data logger can log and store information in eight (8) universal inputs, AC power and backup battery voltage. You must be on-line with the unit to program Data logging. You can also access the Data Log programming from the toolbar button labeled 'Data Log".

Note: Whenever you change any parameters on the data log form, the data logger in the GMS 2000 will be reset. If you need to make changes to your programming, be sure to "Retrieve Data" first.

Viewing the Data Logger (on-line):

Once the Data Logger has been downloaded, it can be viewed in the Data Logger Form. Click the "View Database" button on the Data Log Programming form. The following will appear.



Data Log Viewer

Viewing the Data Logger (off-line):

To view a unit's downloaded Data Logger off-line, follow the instructions for "Offline Communication". Below is a list of programming parameters for viewing the Data Logger.

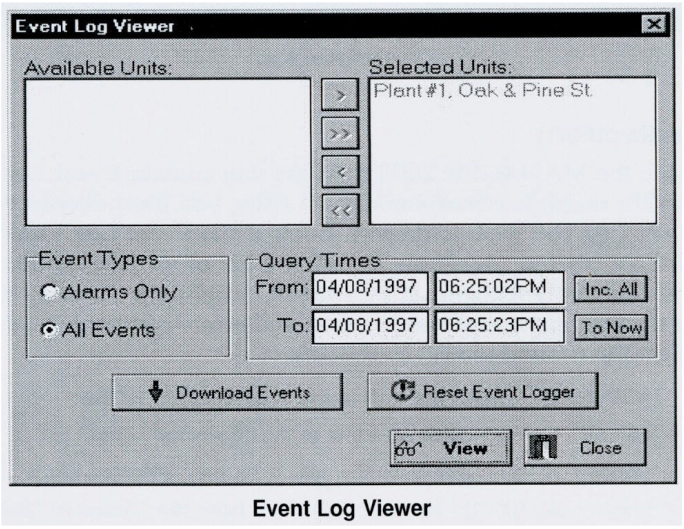
4.17.3.6 EVENT LOGGER

The GMS 2000 keeps track of important system events with its built-in Event Logger. Each GMS 2000 unit stores the last 500 system events. System events include alarms, incoming and outgoing phone calls, and alarm acknowledgments. Once the Event Log is full, the oldest record is overwritten by the newest.

Downloading the Event Logger:

To view GMS 2000's Event Log, the unit's Event Logger must first be downloading to your PC. You must be online with the unit to download the Event Log. Choose "Functions" from the main menu and then select "View Events". You can also access the Event Logger from the toolbar button labeled "Events".

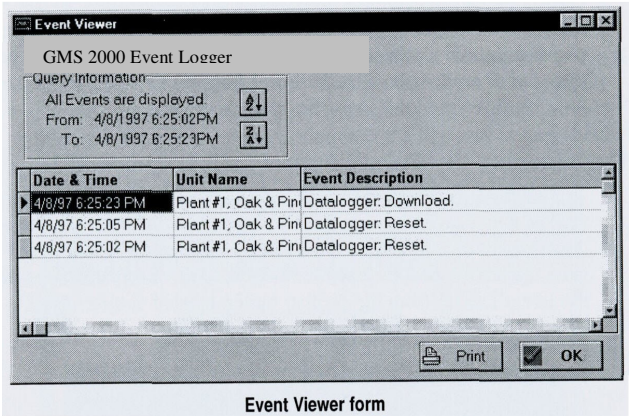
The following event log form will appear:



Event Log Viewer

Viewing the Event Logger:

Once the Event Logger has been downloaded, it can be viewed on the form called "Event Viewer".
Below is a list of programming parameters for viewing the Event Logger:



Event Viewer form

4.18 OPTIONAL ECC – (EMERGENCY CIRCUIT CONVERTER) – P/N 9100-1501

4.18.1 Installation

Indoor use only: Simple and fast installation in ceiling or wall mounted standard single gang E-box. ECCA qualified electrician must perform the installation per the Installation, Operation and Maintenance Instructions provided with the ECC.

4.18.2 Operation

When used with an inverter system, the ECC is designed to allow you the ability to turn off all of the lighting in a given area via the local switch, and still provide emergency lighting during a power disruption. The device will provide single-phase power from the emergency source to the designated emergency fixtures regardless of their current status (on or off), thereby insuring safe egress from the facility. The automatic diagnostic feature will confirm the emergency system is ready to provide back-up power.

4.18.3 Specifications

Description: ECC - EMERGENCY CIRCUIT CONVERTER OPTION

Part Number: 9100-1501-01 - 120 VAC

9100-1501-01- 277 VAC

Rating: 120 VAC - 20 A Ballast load, 1000 W Tungsten Lamp load, 20 A, 1 HP

277 VAC – 20 A Ballast load, 1800 W Tungsten Lamp load, 20 A, 1.5 HP

Operating Temperature: 20 to 150 F

Flame rating: UL 94V-O

Size: 2.75”W x 4.75”H x 1.75”D (overall)

Low profile – recessed portion is only 1.5” deep

Color: White

Weight: 8 oz.

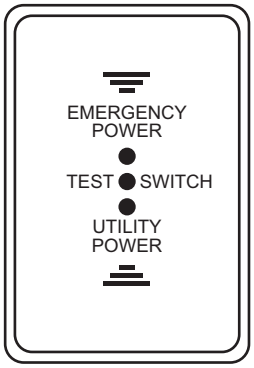


ILLUSTRATION 4-12: ECC EMERGENCY CIRCUIT CONVERTER

4.19 OPTIONAL ECM - EMERGENCY CONTROL MODULE – P/N 9100-1502

4.19.1 Installation

Indoor use only: ECM is a universal mount unit that allows simple and fast installation in the ceiling or a wall mounted standard single gang e-box (recommended box size 4). ECCA qualified electrician must perform the installation per the Installation, Operation and Maintenance Instructions provided with the ECC.

4.19.2 Operation

Emergency power is provided from a central lighting inverter that is automatically switched to a 24-hour emergency power distribution panel. The room switch turns on and off both regular and emergency lights simultaneously. This is accomplished by having the room switch leg power activate the Emergency Control Module. Wire input #1 is connected internally to a sensing circuit. During a power interruption, this circuit causes contact X to drop into an N.C. position. Please review the wiring schematics.

4.19.3 Specification

Description:	ECM - EMERGENCY CONTROL MODULE
Part Number:	9100-1502-01 - 120 VAC
	9100-1502-02 - 277 VAC
Rating:	Maximum Ballast load 1500 W, 120 and 277 VAC
	20 A N.C. UL contact rating
	High Voltage surge protectors
Approvals:	UL 924, NFPA 1104-2.4.1, OSHA
	NEC 700 thru 700-26, 701-717,702-709, 705-750,
Operating Temperature: 210 to 150 F	
Size:	2.75”W x 1.5”H x 1.25”D (overall)
Color:	Black
Weight:	8 oz.

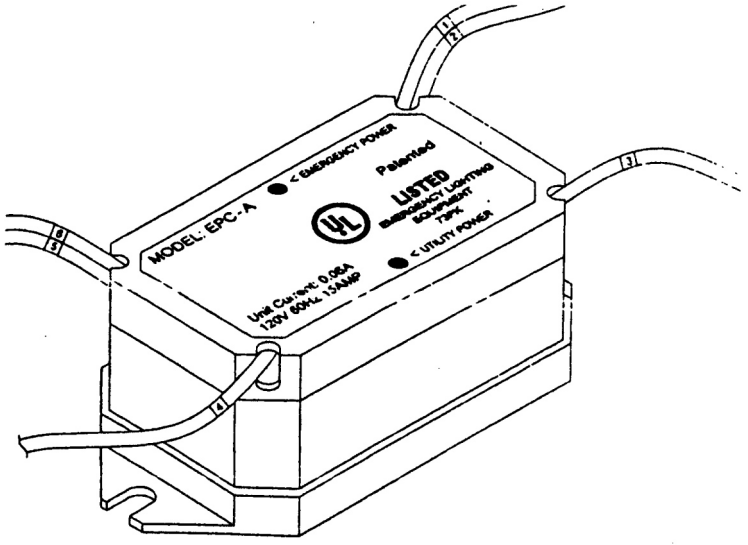


ILLUSTRATION 4-13: ECM EMERGENCY CONTROL MODULE

SECTION 5 – MAINTENANCE

5.1 SAFETY PRECAUTIONS

The Power Wave 3 requires regularly schedule periodic maintenance.

Danger!

READ AND UNDERSTAND THIS SECTION THOROUGHLY BEFORE PERFORMING ANY MAINTENANCE WORK ON OR AROUND THE UNIT. READ THE BATTERY MANUFACTURER'S MANUAL AND MATERIAL SAFETY DATA SHEETS BEFORE WORKING ON OR NEAR THE BATTERIES.

ONLY NORMAL SAFETY PRECAUTIONS ARE REQUIRED WHEN THE UNIT IS OPERATING WITH ALL CABINET DOORS CLOSED. HOWEVER, THE UNIT AND BATTERY CABINETS MUST BE KEPT FREE OF STANDING PUDDLES OF WATER, EXCESS MOISTURE, OR DEBRIS. DEBRIS CONSISTING OF EXCESSIVE DUST IN AND AROUND THE UNIT WILL BE PULLED INTO THE UNIT BY THE COOLING FANS.

Danger!

ONLY FACTORY TRAINED OR AUTHORIZED PERSONNEL SHOULD ATTEMPT TO INSTALL OR REPAIR THE UNIT OR ITS BATTERY SYSTEM. IMPROPER INSTALLATION HAS PROVEN TO BE THE SINGLE MOST SIGNIFICANT CAUSE OF START-UP PROBLEMS. SERVICE PERSONNEL SHOULD WEAR INSULATING SHOES FOR ISOLATION FROM DIRECT CONTACT WITH THE FLOOR (EARTH GROUND), AND SHOULD MAKE USE OF RUBBER MATS WHEN PERFORMING MAINTENANCE ON ANY PORTION OF THE UNIT WHILE IT IS UNDER POWER. HIGH AC AND DC ELECTRICAL VOLTAGES ARE PRESENT THROUGHOUT THE UNIT (S) AND INCORRECT INSTALLATION OR SERVICING COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT MALFUNCTION.

Danger!

SPECIAL SAFETY PRECAUTIONS AND LOCKOUT TAGOUT PROCEDURES ARE REQUIRED FOR ALL OPERATIONS INVOLVING THE HANDLING, INSTALLATION, OR MAINTENANCE OF THE UNIT SYSTEM AND ANY ASSOCIATED BATTERY CABINETS. FAILURE TO FOLLOW SAFETY PROCEDURES COULD RESULT IN DEATH, INJURY OR DAMAGE TO EQUIPMENT.

Danger!

THIS EQUIPMENT CONTAINS CIRCUITS THAT ARE ENERGIZED WITH HIGH VOLTAGES. ONLY TEST EQUIPMENT DESIGNED FOR TROUBLESHOOTING HIGH VOLTAGES SHOULD BE USED, PARTICULARLY FOR OSCILLOSCOPES AND PROBES.

ALWAYS CHECK WITH AN AC AND DC VOLTMETER TO ENSURE SAFETY BEFORE INITIATING CONTACT OR USING TOOLS. EVEN WHEN THE POWER IS OFF, DANGEROUSLY HIGH POTENTIAL VOLTAGES MAY EXIST AT CAPACITOR BANKS. ALWAYS OBSERVE BATTERY PRECAUTIONS WHEN OPERATING NEAR ANY BATTERIES.

FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DEATH, INJURY OR DAMAGE TO EQUIPMENT.

Danger!

OBSERVE ALL BATTERY SAFETY PRECAUTIONS DURING INSTALLATION OR SERVICE OF THE UNIT OR BATTERIES. EVEN WITH THE BATTERY CIRCUIT BREAKER IN THE OFF POSITION, THE DANGER OF ELECTROCUTION MAY STILL BE PRESENT. THE BATTERY POWER TO THE UNIT MUST BE LOCKED AND TAGGED "OFF" BEFORE PERFORMING ANY SERVICE OR WORK ON THE UNIT. THE BATTERY MANUFACTURER'S SAFETY INFORMATION AND MATERIAL SAFETY DATA SHEET IS LOCATED IN A POCKET ATTACHED TO THE INSIDE OF LEFT DOOR OF EACH UNIT. FAILURE TO FOLLOW THOSE INSTRUCTIONS AND THE INSTRUCTION LISTED ABOVE AND ELSEWHERE IN THIS MANUAL COULD RESULT IN AN EXPLOSION, FIRE, EQUIPMENT MALFUCTION, OR ELECTROCUTION.

Danger!

BE CONSTANTLY AWARE THAT THE UNIT SYSTEM CONTAINS HIGH DC AS WELL AS AC VOLTAGES. WITH INPUT POWER OFF AND THE BATTERY DISCONNECTED, HIGH VOLTAGE AT THE FILTER CAPACITORS AND POWER CIRCUITS SHOULD DISCHARGE WITHIN 30 SECONDS. HOWEVER, POWER CIRCUIT MALFUNCTIONS CAN OCCUR, SO YOU SHOULD ALWAYS ASSUME THAT HIGH VOLTAGE MIGHT STILL EXIST AFTER SHUTDOWN. VERIFY THAT POWER IS OFF USING AC AND DC VOLTMETERS BEFORE MAKING CONTACT.

5.2 WHEN TO CALL (1-800-PWR-SRVC – 1-800-797-7782)

Call for service if you encounter any of the following conditions:

1) Repeated start-up attempts are unsuccessful.

2) A unit fault occurs which cannot be cleared.

3) Normal operation of the critical load repeatedly causes an overload condition. This is not a unit fault but a qualified person must analyze the total load connected to the unit to prevent malfunction. Momentary overload conditions will be handled within the parameters of the unit but sustained overloads will cause failure.

4) Any indicators or alarms operate abnormally or continuously.

5) Any other abnormal function of the system occurs.

6) If any abnormal battery condition is detected.

7) When you are unsure of what action to take.

5.3 STEPS TO TAKE

If any of the above occur:

1) Consult Appendix C, LCD Display Menu and Troubleshooting Guide. Record information on the LCD Display to relay to OnLine Power Customer Service and Support.

2) Call OnLine Power Customer Support at 1-800-797-7782 or 1-800-PWR-SRVC.

Danger!

LETHAL VOLTAGES ARE PRESENT INSIDE THE EQUIPMENT EVEN WHEN THERE APPEARS TO BE NO INPUT POWER TO THE UNIT. PROTECT YOURSELF FROM THE RISK OF ELECTROCUTION BY REFERRING SERVICE TO QUALIFIED PERSONNEL ONLY.

5.4 PREVENTATIVE MAINTENANCE

The unit maintenance consists of the basic tasks listed in this section. Other maintenance functions require OnLine Power factory trained service personnel. In order to comply with the terms of the prorated battery warranty, you must maintain at least an annual individual voltage record of each battery with evidence that the terminal connections have been torque checked.

Preventive Maintenance List

Description
Visual inspection
Check Room Temperature
Removal of dust from all electronics
Verification of all electrical connection
Check all Batteries post and connection for corrosion
Check for batteries deformations
Record all batteries Nominal Voltages
Record all batteries Floating Voltages
Functional Test of all major components
Functional test of all electronics
Functional Test of system including batteries
Record all findings

5.4.1 Maintenance Log

Carefully record keeping will ensure proper maintenance of the unit, and assist in the correction of any abnormal conditions.

At a minimum, the Maintenance log should contain the following information:

- Date of system start-up.
- Dates that battery maintenance was performed.
- Dates input, output, and battery status readings were checked and the values displayed for these readings.
- Date of load changes.
- Dates and summaries of all communications with OnLine Power service personnel.
- Every six (6) months or at least annual, individual battery voltage & torque check.

5.4.2 Periodic Testing of unit

The unit should be manually exercised on a periodic basis (once every three months, for example). This forces the unit to transfer to the battery and return to main power. This process activates self-diagnostic testing, which may reveal conditions that require attention.

5.4.3 Maintaining the Batteries

Danger!

THE BATTERY CIRCUIT BREAKER OPERATES AT THE RATED BATTERY VOLTAGES AT ALL TIMES. A TRIPPED BATTERY CIRCUIT BREAKER INDICATES A SERIOUS PROBLEM THAT MAY RESULT IN SERIOUS INJURY OR DAMAGE TO THE EQUIPMENT, DO NOT CLOSE THE CIRCUIT BREAKER WITHOUT KNOWING WHY IT FAILED. CHECK FOR A SHORT IN BATTERY OR CONNECTIONS. CALL ONLINE POWER CUSTOMER SERVICE AND SUPPORT FOR ASSISTANCE AT 1-800-PWR-SRVC.

Danger!

THE BATTERY ELECTROLYTE IS A DILUTED SULFURIC ACID THAT IS HARMFUL TO THE SKIN AND EYES. IT IS ELECTRICALLY CONDUCTIVE AND CORROSIVE. WEAR FULL EYE AND HAND PROTECTION ALONG WITH PROTECTIVE CLOTHING. IF THE ELECTROLYTE CONTACTS THE SKIN, WASH IT OFF IMMEDIATELY WITH WATER. IF ELECTROLYE CONTACTS THE EYES, FLUSH THOROUGHLY AND IMMEDIATELY WITH WATER. SEEK IMMEDIATE MEDICAL ATTENTION. SPILLED ELECTROLYTE SHOULD ADDRESSED PER APPROPRITE HARADIDEROUS SPILL CLEANUP PROCEDURES.

Danger!

DO NOT DISPOSE OF A BATTERY OR BATTERIES IN A FIRE. THE BATTERIES MAY EXPLODE CAUSING DEATH OR SERIOUS INJURY.

Cautions **Do not substitute batteries from other manufacturers without the express approval of OnLine Power Customer Service personnel.**

- **The use of any battery other than Online-Power may cause damage to the inverter and voids your Online-Power warranty.**

Caution **Lead-acid batteries contain hazardous materials and must be handled, transported, and recycled or scrapped in accordance with federal, state and local regulations. Since lead is a toxic substance, lead-acid batteries should be recycled rather than scrapped.**

Caution **A battery can present a risk of electrical short and high short circuit current. The following precautions should be observed when working on or around batteries:**

- **Remove watches, rings, necklaces, or other metal objects.**
- **Use only tools with insulated handles.**
- **Wear rubber insulating gloves and boots.**
- **Do not lay tools or metal parts on top of batteries.**
- **Disconnect charging source prior to connecting or disconnecting battery terminals.**
- **Verify that battery cabinets are properly grounded.**

Danger!
DO NOT GROUND BATTERY POSITIVE OR NEGATIVE

Caution **Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following safety procedures must be followed:**

- **DO NOT SMOKE when near batteries.**
- **DO NOT cause flame or sparks in battery areas.**
- **Discharge static electricity from your body before touching batteries by first touching a grounded metal surface.**

Caution

When replacing batteries, use the same number of batteries, of the same manufacturer, type and model that was supplied with the unit. To avoid system malfunction, replace all batteries in each string if one or more batteries fail to perform to specifications. Please record all individual cell voltages on the chart.

5.4.4 Battery Cabinets

Although the individual batteries are sealed and require minimal maintenance only, the batteries should be given a periodic inspection and electrical check every six months.

Battery Service Agreements are available through OnLine Power Customer Service and Support at 1-800-PWR-SRVC (800-797-7782).

In order to qualify for battery warranty replacement, you will need to show records of the battery maintenance history including battery numbers, battery voltages (individual cells), terminal torque measurements and dates of maintenance.

5.4.5 Power Connections

- Check for corrosion and connection integrity. Visually inspect wiring for discolored or cracked insulation. Clean and / or re-torque as required.
- All Battery terminal connections must be tighten with proper torque value set in accordance with the table or instructions provided by battery manufacturer.
- Use the correct torque tool to tighten the terminal bolts as indicated in table below and use all hardware's provided with batteries.

Type – Standard VRLA Battery

Battery part number	Initial torque in LBS	Annual re-torque in LBS	Terminal Type	Hardware
PRC-12150 C (150AH)	120 IN-LB / 13.6 NM	115 IN-LB / 13.6 NM	Copper Insert Terminal	¼ - 20 UNC Bol t
UB 12750	88.5 IN-LB / 10 NM	84 IN-LB / 9.5 NM	Z1 "Z" post type terminal	1 to 1.25" long bolt w/14mm head, 14mm nut, 8mm washer & lockwasher
UB12900	88.5 IN-LB / 10 NM	84 IN-LB / 9.5 NM	Same as above	Same as above
UB12110	88.5 IN-LB / 10 NM	84 IN-LB / 9.5 NM	Same as above	Same as above

Type G – Longer warranty battery

Battery part number	Initial torque in LBS	Annual re-torque in LBS	Terminal Type	Hardware
GSLF – 10512	120 IN-LB / 13.6 NM	115 IN-LB / 13.0 NM	Copper Insert	¼ "
GSLF - 12012	120 IN-LB / 13.6 NM	115 IN-LB / 13.0 NM	Copper Insert	¼ "

Type N – Nickel-Cad battery (only nickel plated copper cable lugs should be used).

Ni-Cad P/N	Recommended Torque		Bolt Diameter
BM 112/ 138	66 IN-LB	7.5 NM	M5
BM 148/ 184	177 IN-LB	20 NM	M8
BM 195/231/277	266 IN-LB	30 NM	M10
NOTE: For annual re-torque; reduce 5 IN-LB from recommended torque value.			

CAUTION: Torque all connections in accordance with the above tables unless provided from battery manufacturer. Failure to do so may create an unsafe condition or fire hazard.

5.4.6 Battery Terminals

- Check for discoloration, corrosion and connection integrity. Clean and tighten as necessary.
- To access battery terminals, remove the top strapping material located at the lower front of the battery shelf. Pull the battery forward to access the battery connections. Disconnect the cables connected to the battery. Once disconnected, insulate the cables to prevent accidental shorts (Use a protective boot or electrical tape). Before replacing the battery connections, clean and re-torque the connection hardware.
- OnLine Power Customer Service personnel must approve use of non-standard batteries. Please call at 1-800-PWR-SRVC (800-797-7782).

5.5 ONLINE POWER CUSTOMER SERVICE AND SUPPORT

Start-up, unit maintenance, battery maintenance, and preventative maintenance programs are available through your OnLine Power sales representative or through OnLine Power Customer Service and Support. A program of periodic **maintenance is recommended once every six months**, but is mandatory once every twelve months since heat and cold will effect the compression of the electrical connections and lack of maintenance will shorten the product's life expectancy possibly causing unsafe operating condition.

5.5.1 Start-Up Services

Various start-up services are available. See your sales representative or telephone OnLine Power Customer Service at 1-800-PWR-SRVC (800-797-7782).

5.5.2 Maintenance Agreements

Standard Full Service, 24/7 Full Service, and Extended On or OFF Site Maintenance agreements are available. See your sales representative or telephone OnLine Power Customer Service at 1-800-PWR-SRVC (800-797-7782).

5.5.3 Warranties

Contact OnLine Power Customer Service and Support at 1-800-PWR-SRVC (800-797-7782) if you have any questions regarding the warranty on your unit, system or batteries.

APPENDIX A – SPECIFICATIONS EFFECIENCY GREATER THAN 90%

Specifications for KVA, 0.8pf Units

POWER RATING (KVA/KW)	10/8	15/12	20/16	25/20	30/24	40/32	50/40	50KW
INPUT and OUTPUT								
INPUT VOLTAGE (VAC)	Three Phase, 4-Wire plus Ground, 208Y/120 or 480Y/277 VAC (-20% to +15%)							
OUTPUT VOLTAGE (VAC)	Three Phase, 4-Wire plus Ground, 208Y/120 or 480Y/277 VAC							
OUTPUT FREQUENCY (Hz)	60 Hz +0.5 Hz							
VOLTAGE REGULATION	3%, Regulated within CBEMA curve							
OUTPUT WAVE FORM	Sine-Wave <5% THD.							
EFFICIENCY	Greater than 90% (Typical)							
CREST FACTOR	3 to 1 Typical							
SURGE PROTECTION	The unit will protect itself and the load against surges as defined in ANSI/IEEE C62.41 Categories A and B.							
ISOLATION	Complete from line. Output neutral bonded to ground							
NOISE ISOLATION	-120 dB Common-Mode; -60 kB Transverse-Mode							
BATTERY	Sealed maintenance-free (AGM) battery							
RECHARGE CURRENT	Comforts to UL Standards							
EXTERNAL BATTERY	Provisions for hardwire connection of optional external battery cabinets or DC source.							
BATTERY								
BATTERY RUN TIME	90 minutes, consult Online Power for other runtimes							
BATTERY TYPE	Sealed, Maintenance-Free, AGM, VRLA type (standard). Consult factory for other type.							
NOMINAL BATTERY VOLTAGE	192 VDC	192 VDC	192 VDC	288 VDC	288 VDC	312 VDC	552 VDC	552 VDC
OVERCURRENT PROTECTION	Circuit Breaker							
PACKAGING	Batteries not housed in Same Enclosure as electronic. Batteries are shipped directly from the battery manufacturer separately to insure freshness.							

Specifications for KVA, 0.8pf Units (Continued)

MONITORING AND COMMUNICATIONS	
INDICATORS	LCD Display Panel
RELAY INTERFACE	Dry Contacts for: Sum Alarm (N.C.); Bypass On (N.O.); Loss of Input Power (N.O.); Low Battery (N.O.)
CONTACT RATING	125 Volts (AC or DC) Maximum; 1.25 Amperes Maximum; 30 Watts / 50 VA Maximum
INTERFACE CONNECTION	Hard Wired (Terminal Block)

ENVIRONMENTAL	
SURGE WITHSTANDABILITY	ANSI C62.41-1980 Categories A and B
OPERATING TEMPERATURE	Meets NEMA Requirements
OPERATING RELATIVE HUMIDITY	0 to 95% Non-Condensing
ALTITUDE	Up to 6,000 Feet (1,829 Meters) with No De-Rating
COOLING	Air Cooled-Forced Fan

PHYSICAL (KVA/KW)	10/8	15/12	20/16	25/20	30/24	40/32	50/40	50KW
SIZE HxWxD in. (cm)	70 x 39 x 20 (177.8 x 99.1 x 50.8)							
WEIGHT lbs (kg) Electronic only (see battery weight for total weight.	1083	1446	1679	1679	1719	2066	2463	2565
CONSTRUCTION	Painted Steel Enclosure with 3 Point Double Locking Front Door; and Full-length Door Hinge.							
ENCLOSURE	Designed for Inside Installations							
COLOR	Black							
ACCESSIBILITY	Front - All Servicing is Through the Front; No Side or Rear Access is Required.							
CABLE ENTRY	Top or sides							
MOUNTING	Four (4) Holes Provided to Anchor Enclosure to Pedestal (Supplied by Others)							
	Note: This is Electronic cabinet only, refer to battery cabinet based on each KVA for 90 min.							

NOTE: This is the basic weight(s). Actual unit weight (s) may vary depending on the option(s) added (approximately 200 lbs variance).

***Due to continuous product improvement this specification is subject to change without prior notice.**

OnLine Power

Recommended Input/ Output Protective Device Ratings, BTU/HR, and Floor Loading

UPS Rating	Input Volt.	Output Volt.	Input Current	Input over current protect (AMP)	Output over current protect (AMP)	Recom Output Current Protect	Batt. Volt	Max. Batt. Disch. AMP	Full Load BTU/HR Max	Electronic Cab Weight Only	Floor Loading LB/SQFT **electronic Cab**	No. of Battery Cabinet	Each Battery Cabinet weight	Floor Loading LB/SQFT **Batt cab**	**Total System Weight w/ 90 min
	3 phase	3 phase	Norm/Max		Norm/Max										
10 kva/8kw	208Y/120	208Y/120	31/38	48	28/35	44	192	56	3032	1083	222	1	1392	286	2475
	480/Y277	480Y/277	14/18	23	12/15	18	192	56	3032	1083	222	1	1392	286	2475
	480Y/277	208Y/120	14/18	23	28/35	44	192	56	3032	1083	222	1	1392	286	2475
15 kva/12kw	208Y/120	208Y/120	47/59	74	42/53	66	192	84	4549	1446	297	2	1612	(2) 331	4670
	480Y/277	480Y/277	21/26	33	18/23	29	192	84	4549	1446	297	2	1612	(2) 331	4670
	480Y/277	208Y/120	21/26	33	42/53	66	192	84	4549	1446	297	2	1612	(2) 331	4670
20kva/16kw	208Y/120	208Y/120	62/78	97	56/70	88	192	112	6066	1679	344	2	1780	(2) 365	5239
	480Y/277	480Y277	27/34	42	24/30	38	192	112	6066	1679	344	2	1780	(2) 365	5239
	480Y/277	208Y/120	27/34	42	56/30	38	192	112	6066	1679	344	2	1780	(2) 365	5239
25kva/20kw	208Y/120	208Y/120	77/76	120	69/86	108	288	85	7582	1679	344	2	2284	(2) 469	6247
	480Y/277	480Y/277	35/44	55	30/38	48	288	85	7582	1679	344	2	2284	(2) 469	6247
	480Y/277	208Y/120	35/44	55	69/86	108	288	85	7582	1679	344	2	2284	(2) 469	6247
30kva/25kw	208Y/120	208Y/120	93/16	145	83/104	130	288	102	9098	1719	353	2	2284	(2) 469	6287
	480Y/277	480Y/277	41/51	64	36/45	56	288	102	9098	1719	353	2	2284	(2) 469	6287
	480Y/277	208Y/120	41/51	64	83/104	130	288	102	9098	1719	353	2	2284	(2) 469	6287
40kva/32kw	208Y/120	208Y/120	123/154	192	111/139	174	312	169	12131	2066	424	3	2288	(3) 592	8930
	480Y/277	480/277	54/68	84	48/60	75	312	169	12131	2066	424	3	2288	(3) 592	8930
	480Y/277	208Y/120	123/54	192	111/139	174	312	169	12131	2066	424	3	2288	(3) 592	8930
50kva/40kw	208Y/120	208Y/120	155/194	242	139/174	217	552	120	15164	2463	505	3 1	2284 1948	(3) 469 (1) 400	11263
	480Y/277	480Y/277	67/84	105	60/75	94	552	120	15164	2463	505	3 1	2284 1948	(3) 469 (1) 400	11263
	480Y/277	208Y/120	155/194	242	139/174	217	552	120	15164	2463	505	3 1	2284 1948	(3) 469 (1) 400	11263
50kw	208Y/120	208Y/120	194/243	303	174/218	272	552	150	18000	2565	526	6	* 2184	(6) 448	15669
	480Y/277	480Y/277	84/105	131	75/94	117	552	150	18000	2565	526	6	* 2184	(6) 448	15669
	480Y/277	208Y/120	194/243	303	174/218	272	552	150	18000	2565	526	6	* 2184	(6) 448	15669

Note: 3-Phase Power Wave 3 electronic is in one cabinet and the batteries are in a separate cabinet. For more information please contact your Sales Engineer.

***** Battery cabinet can be reduced to 5 using larger 150AH batteries (4) 2670 lbs. floor loading 548 lbs. and (1) 2270 lbs. floor loading 466 lbs.

** ± 5% Depend on options added.

APPENDIX B - BATTERY CONNECTIONS

Caution **For the actual battery connection diagram for your system, refer to the diagram on each unit. The drawings below are shown for electrical connection only and do not necessarily match the actual battery layout in your unit. The arrangement may be different from drawings.**

Danger!

The use of a physically damaged battery can cause a catastrophic system failure and can even result in a fire or explosion that could endanger life and property. Before accepting a battery shipment from the carrier, please read and follow these instructions:

1. Thoroughly inspect each battery for any signs of damage. If there is any damage, reject the shipment and notify the manufacturer at 800-PWR-SRVC (800-797-7782). If possible, photograph the damage for future reference.
2. As you unpack the pallet or container, check each battery box for damage on all sides, the top and bottom. If there is any sign of damage, photograph the damage if possible, and contact Online Power at 800-PWR-SRVC (800-797-7782).
3. Before you install each battery in the cabinet, remove it from its carton and thoroughly inspect it again on every side, the top and bottom for any signs of physical damage including, but not limited to, cracks, chips, leaks, bulges, and so forth.
4. If battery is dropped or makes hard contact with any abject, inspect it again.
5. Batteries are heavy, so exercise care when lifting them to the shelves of a battery cabinet.
6. If at any time you have any questions regarding the condition of a battery, set it aside and notify the manufacturer at 800-PWR-SRVC (800-797-7782). **Do not use a questionable battery under any circumstances, even temporarily.**

The following diagrams show various battery connection configurations in the battery cabinets that are shipped with the unit. Refer to **Table A-1** for typical nominal battery voltage information. Depending on your back up time, you may have more than one string of batteries to meet your requirement.

192-Volt Nominal (Typical)

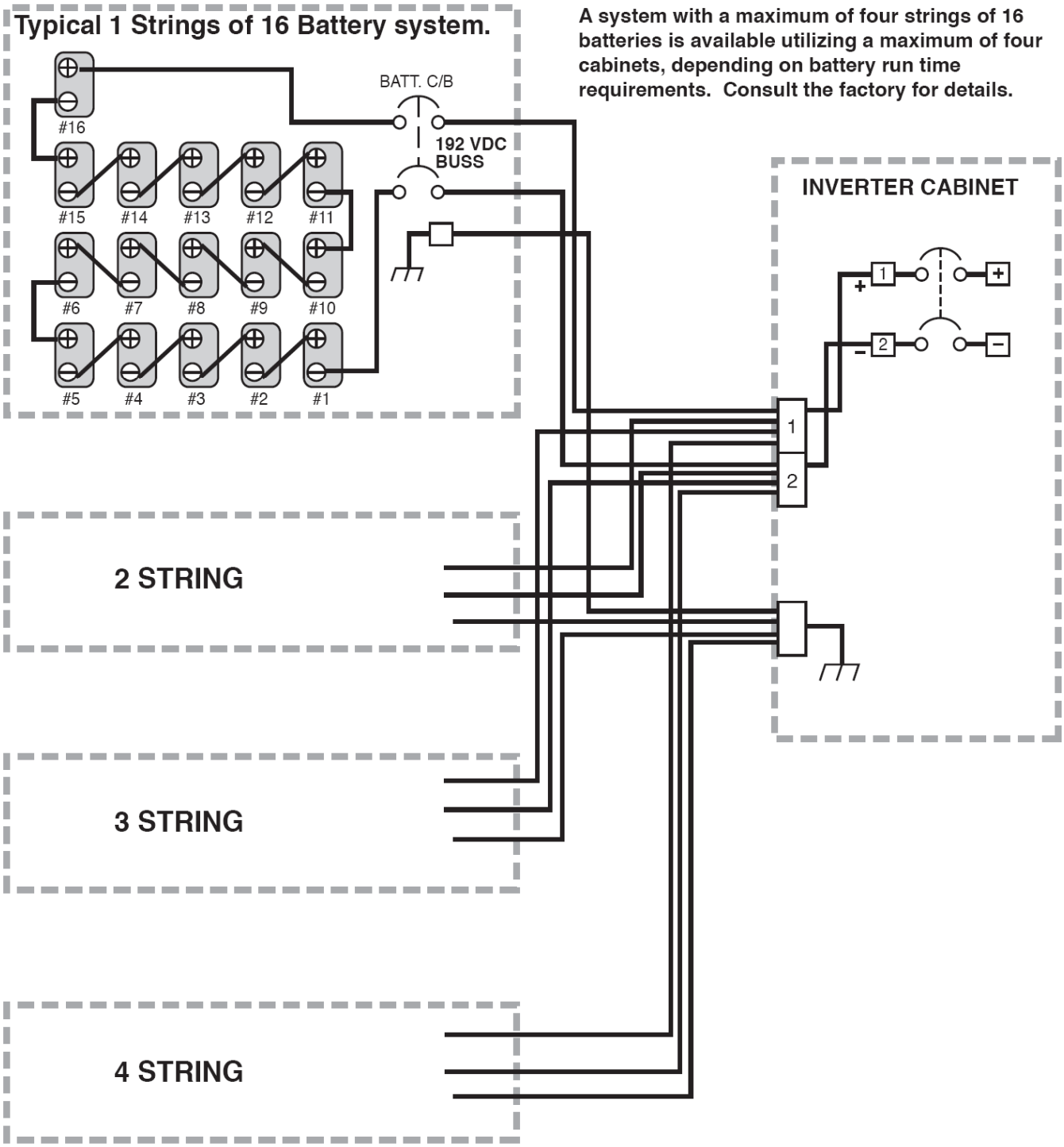


ILLUSTRATION B-1

288-Volt Nominal (Typical)

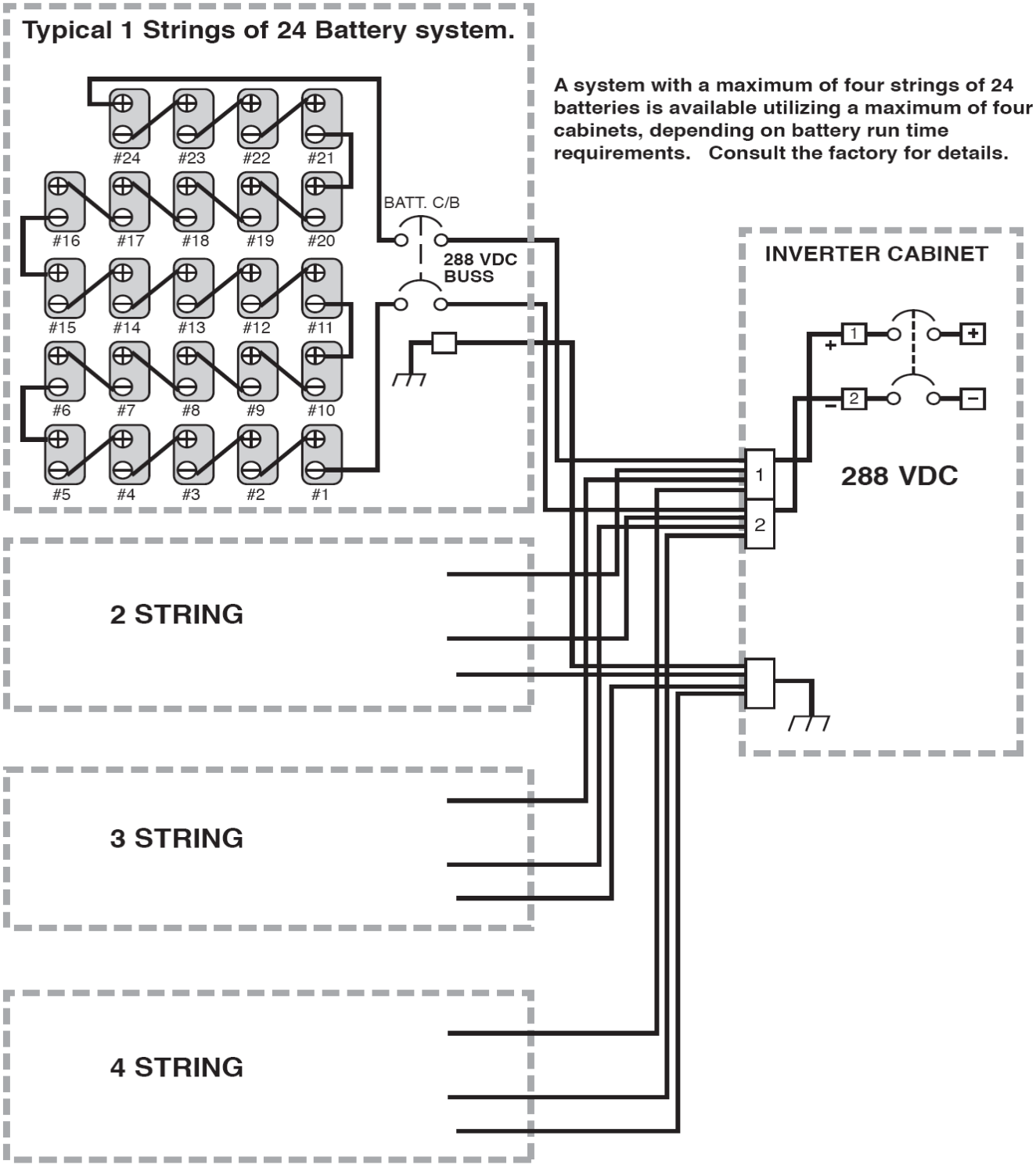


ILLUSTRATION B-2

312 Volts Nominal (Typical)

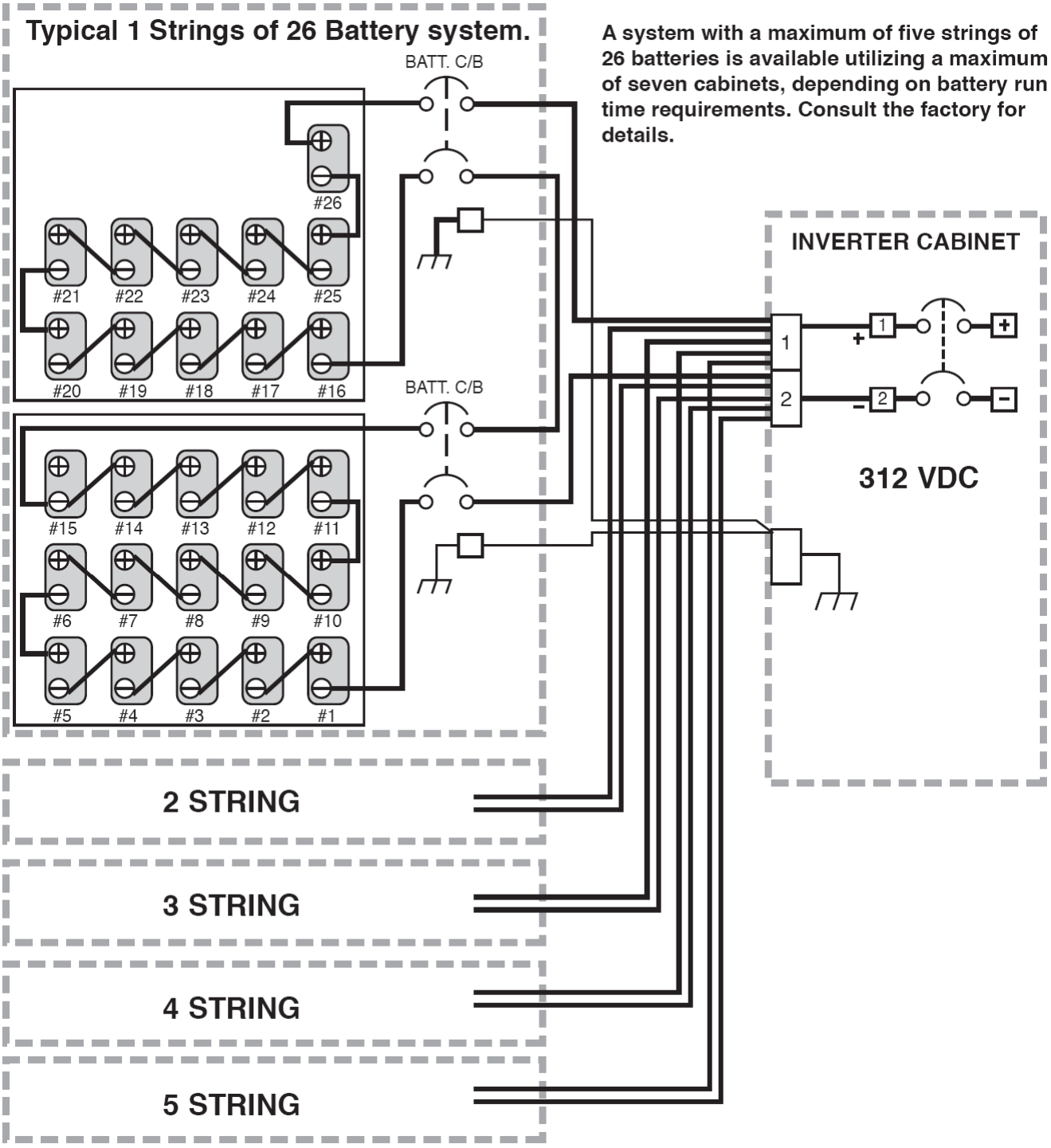

Typical 1 Strings of 26 Battery system.
A system with a maximum of five strings of 26 batteries is available utilizing a maximum of seven cabinets, depending on battery run time requirements. Consult the factory for details.
BATT. C/B
#26
#21 #22 #23 #24 #25
#20 #19 #18 #17 #16
BATT. C/B
#15 #14 #13 #12 #11
#6 #7 #8 #9 #10
#5 #4 #3 #2 #1
INVERTER CABINET
1
2
+
-
312 VDC
2 STRING
3 STRING
4 STRING
5 STRING

ILLUSTRATION B-3

552 Volts Nominal (Typical)

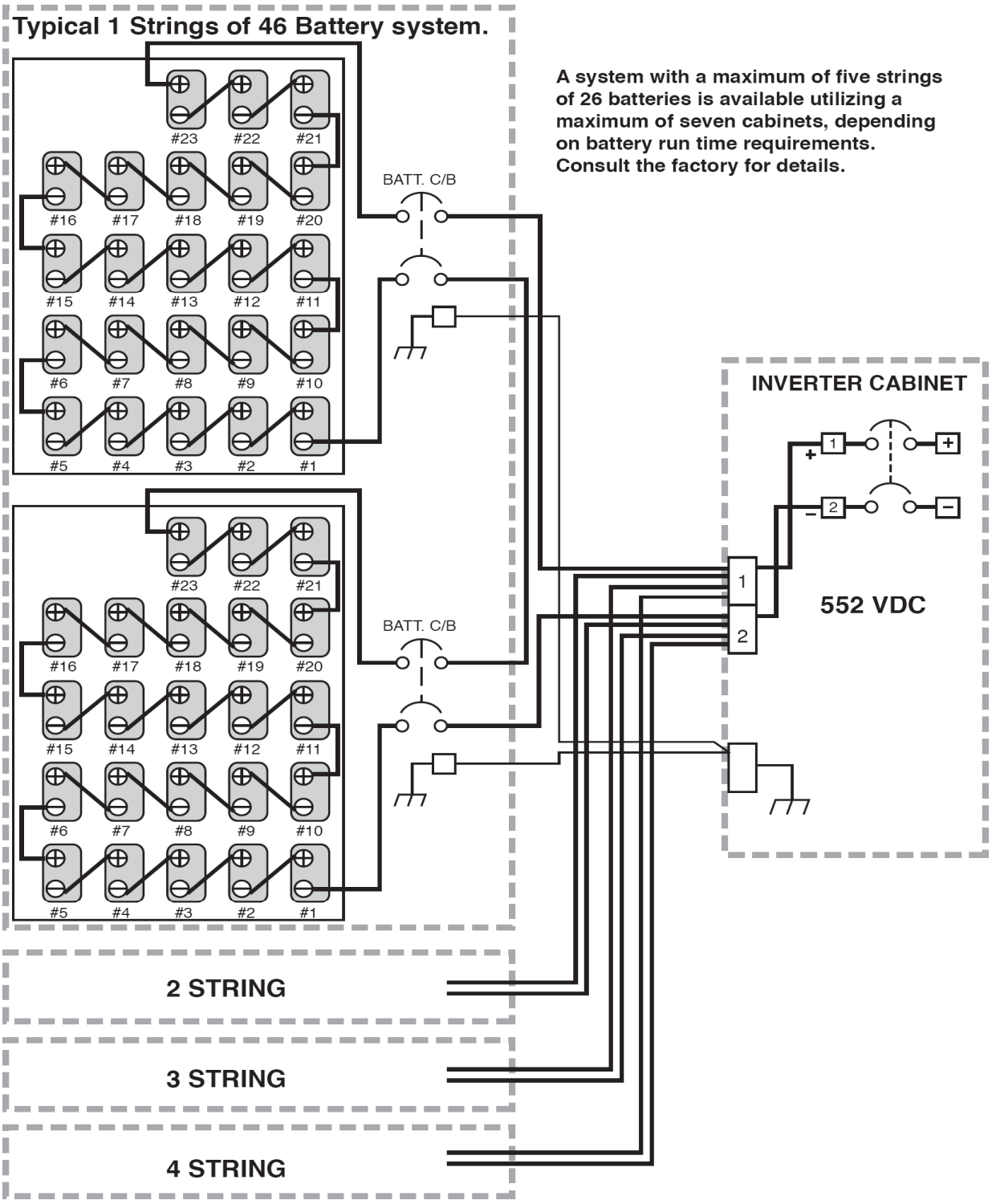

Typical 1 Strings of 46 Battery system.
A system with a maximum of five strings of 26 batteries is available utilizing a maximum of seven cabinets, depending on battery run time requirements. Consult the factory for details.
#23 #22 #21
#16 #17 #18 #19 #20
#15 #14 #13 #12 #11
#6 #7 #8 #9 #10
#5 #4 #3 #2 #1
BATT. C/B
BATT. C/B
INVERTER CABINET
1
2
552 VDC
2 STRING
3 STRING
4 STRING

ILLUSTRATION B-4

APPENDIX C - LCD DISPLAY MENU AND TROUBLESHOOTING GUIDE

The Power Wave 3 utilizes an on-board microprocessor that continuously monitors and displays all functions (measurement, alarm, alert, and system status) in real time by utilizing high frequency digital signal processing for a reliable and user friendly battery back up system.

Two screens (A, B) are updated continuously.

Start-up Screen

When input power is applied to the unit, LCD panel lights up and displays

OnLine Power UPS

If the LCD display panel is not lit, a problem exists. Contact OnLine Power Services at 1-800-PWR-SRVC (800-797-7782).

Screen A: The first default screen appears as below

UPS NORMAL @ XX KVA INPUT OK @ CHRG ON BATTERY OK @ DC OK ON INVERTER @ OUT OK

The display may say:

Line 1: UPS NORMAL @ XX KVA

XX KVA indicates the KVA rating, STAND BY or NORMAL indicating normal operating modes. STAND BY ALARM MALFUNCTION indicates unit alarm condition and MALFUNCTION indicates that the unit failed or had a persistent alarm condition. This will require a system reset by cycling power. Shut the unit off and wait until LCD is dark. Restart the unit.

Line 2: INPUT OK @ CHG ON

INPUT OK:	Input is within an acceptable range.
INPUT BAD:	Input is out of range.
CHRG ON:	Charger on.
CHRG OFF:	The charger is off. This will happen if the input capacitor is open or the system is in a malfunction mode – Unit ALARM.

Line 3: BATTERY OK @ DC OK

BATTERY OK:	Battery voltage is within an acceptable range.
BATTERY OV:	Battery voltage is high. This is normal when the battery is charging.
BATTERY LOW:	Battery voltage is low. Recharge the battery.
DC OK:	DC bus voltage is within an acceptable range.
DC OV:	DC bus voltage is too high. - UNIT ALARM.
DC UV:	DC bus voltage too low. - UNIT ALARM.

NOTE: The typical DC buss voltage should be higher than the battery voltage.

SCREEN B: The second default screen appears as below

Line 1: Indicates the output voltage and power in watts.

Line 2: Indicates the input volts and amps.

Line 3: Indicates the internal DC bus condition for factory use.

Line 4: Indicates the battery voltage. The (+) current in Amps indicates charging amps, while (-) indicates discharging Amps.

APPENDIX D – Drawings

(All drawings can be downloadable from our Website: www.onlinepower.com)

1. Three Phase unit Installation - Installation – Dwg. 6001-032-03
2. Unit and Battery Cabinet Configuration layout (Battery Cabinet Layout) – Dwg. 6001-032-05
3. Unit and Battery Cabinet Installations (Battery Cabinet Layout) – Dwg. 6001-032-06
4. Unit and Battery Cabinet Installations with Stackable Rack – Dwg. 6001-032-07
5. 3 Phase unit Functional Block Diagram – Single Line Diagram, Single Input – Dwg. 6001-032-11
6. 3 Phase unit Functional Block Diagram – Single Line Diagram, Dual Input Wye-Wye – Dwg. 6001-032-04
7. 3 Phase unit Functional Block Diagram – Single Line Diagram Dual Input Delta-Delta – Dwg. 6001-032-10
8. Unit and Battery Cabinet Seismic Certification Drawing – Dwg. 6002-1658 (09-0319-A)
9. 3 Ph. External Wrap Around by pass panel 3,4 Pole By-Pass Panel, 55 A – 350 A, same I/O Dwg. 6001-032-27 and 6001-032-27S
10. 3 Ph. External Wrap Around 3,4 Pole By-Pass Panel, 55 A – 350 A, Dwg. with same I/O optional load disconnect 6001-032-28 and 6001-032-28S
11. 3 Ph. External Wrap Around 3,4 Pole By-Pass Panel, 55 A – 350 A, Dwg. with different I/O DWR. 6001-032-29S

TABLES

1. Allowable Ampacities of Insulated Conductors Rated 0-2000 V, 60 to 90 deg. C, (140 – 194 deg. F). Table 310-16 of National Electrical Code.
2. NEC (National Electrical Rating of the Wire)
3. Connection Type / Wire Size Range
4. Torque Specifications (Unless Otherwise Labeled)
5. Specifications

***Due to continuous product improvement this specification is subject to change without prior notice.**

SECTION 6 – INSTALLATION

6.1 SITE PLANNING AND PREPARATION

The Power Wave 3 is designed for installation indoors and meets NEMA specifications for operating temperature, humidity, and utility voltage. The cabinets is rugged and corrosion resistant and the footprint of the Power Wave 3 is less than 6 square feet. Listed below are the environmental specifications for the Power Wave. Adequate clearance in the front of the equipment **MUST** be provided for service access.

6.1.1 Operating Environment

- AMBIENT TEMPERATURE 0°C to 40° C (-32 °F to 104° F)
- OPERATING ALTITUDE 1,829 M (6,000 FT) DERATE 10% FOR EACH ADDITIONAL 305 M (1,000 FT) UP TO 2,744 m (9,000 FT)
- RELATIVE HUMIDITY 0% to 95% (non-condensing)

Operating the Power Wave and batteries at either extreme of the temperature range may affect the long-term reliability of the system. This is especially true of the sealed, maintenance-free batteries. Sealed, maintenance-free batteries are designed to operate at normal room temperatures (72 °to 77 °F/ 22.2°C to 25°c)

6.1.2 Storage Environment

Provide a storage environment, which meets the following conditions:

- AMBIENT TEMPERATURE: -20° C to 70°C (-4°F to 158°F).
- RELATIVE HUMIDITY: 0% to 95% non-condensing.
- NOTE: System should be stored in its original packaging.
- **Batteries must be recharged after 90 days if they are not put into service, otherwise the batteries will be permanently damage.**
- Batteries have longer shelf life if they are stored below 25°C (77°F). Keep stored batteries fully charged. Recharge the batteries every 90 days.

6.1.3 Location Considerations (Illustration 6-1) See Technical drawings.

Site Planning Specifications: Refer to details in A-3 Table

KVA	INPUT - OUTPUT VOLTAGE	MODEL NUMBER (0.8 Power Factor)	(Electronic) W" X H" X D"	BATTERY VOLTAGE
10	208Y/120 - 208Y/120	PW010B05LHT3-VA	39 X 68 X 18	192
	480Y/277 - 480Y/277	PW010H09LHT3-VA	39 X 68 X 18	192
15	208Y/120 - 208Y/120	PW015B05LHT3-VA	39 X 68 X 18	192
	480Y/277 - 480Y/277	PW015H09LHT3-VA	39 X 68 X 18	192
20	208Y/120 - 208Y/120	PW020B05LHT3-VA	39 X 68 X 18	192
	480Y/277 - 480Y/277	PW020H09LHT3-VA	39 X 68 X 18	192
25	208Y/120 - 208Y/120	PW025B05LHT3-VA	39 X 68 X 18	288
	480Y/277 - 480Y/277	PW025H09LHT3-VA	39 X 68 X 18	288
30	208Y/120 - 208Y/120	PW030B05LHT3-VA	39 X 68 X 18	288
	480Y/277 - 480Y/277	PW030H09LHT3-VA	39 X 68 X 18	288
40	208Y/120 - 208Y/120	PW040B05LHT3-VA	39 X 68 X 18	312
	480Y/277 - 480Y/277	PW040H09LHT3-VA	39 X 68 X 18	312
50	208Y/120 - 208Y/120	PW050B05LHT3-VA	39 X 68 X 18	552
	480Y/277 - 480Y/277	PW050H09LHT3-VA	39 X 68 X 18	552
50KW	208Y/120 - 208Y/120	PW062B05LHT3-VA	39 X 68 X 18	552
	480Y/277 - 480Y/277	PW062H09LHT3-VA	39 x 68 x 18	552

6.1.4 Cable Access

Blocking air vents will cause equipment over heating and malfunction. For best performance , the air around the unit must be clean, dust free and free of chemical or other contaminantion. Do not place the system or batteries in a sealed container or room.

Caution

The Power Wave 3 Cabinet Installation Diagrams for 10~50 KVA and 50 KW models provide cable/conduit openings on the top and sides of the cabinet. Refer to Illustration 6-1.

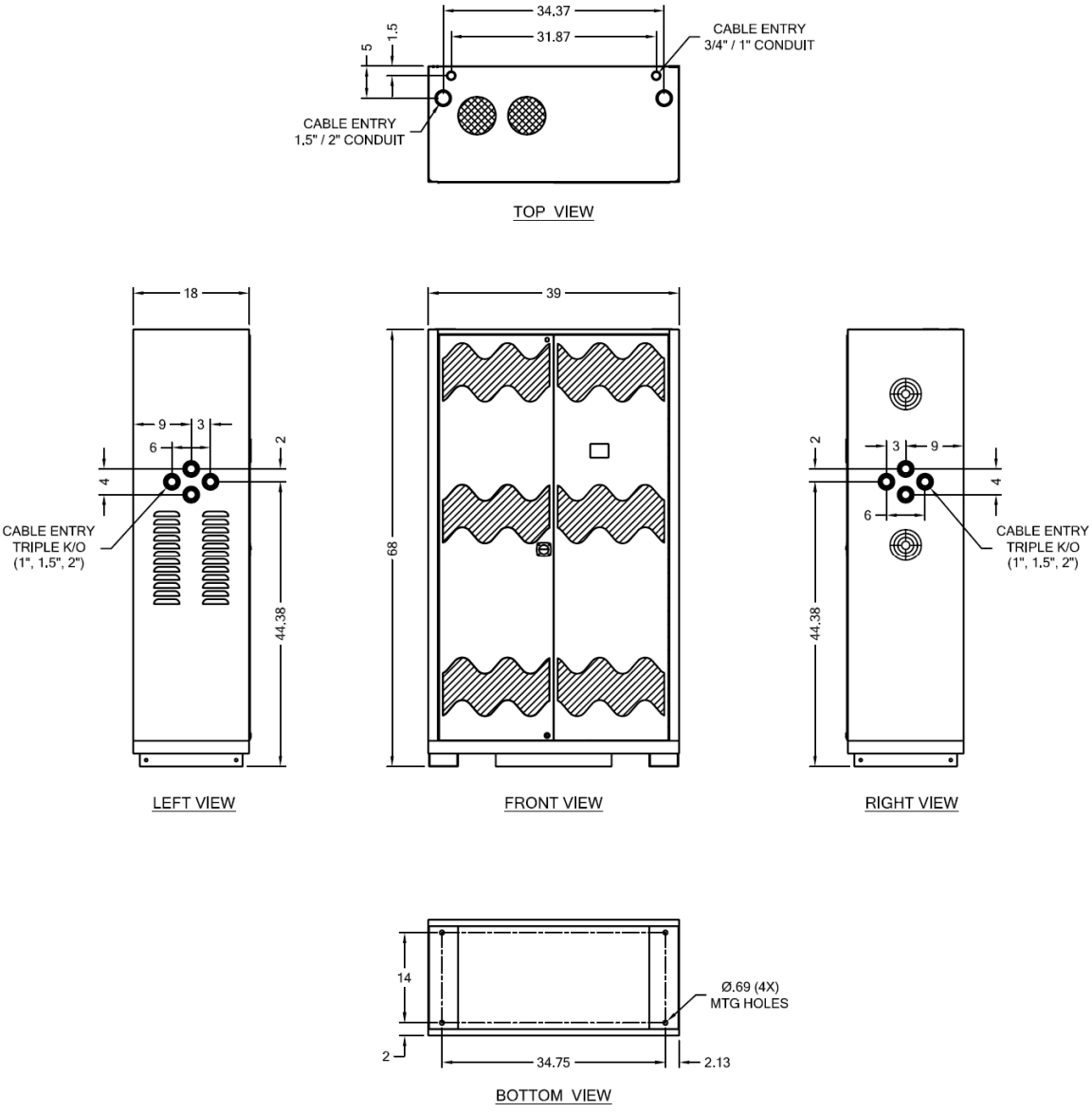
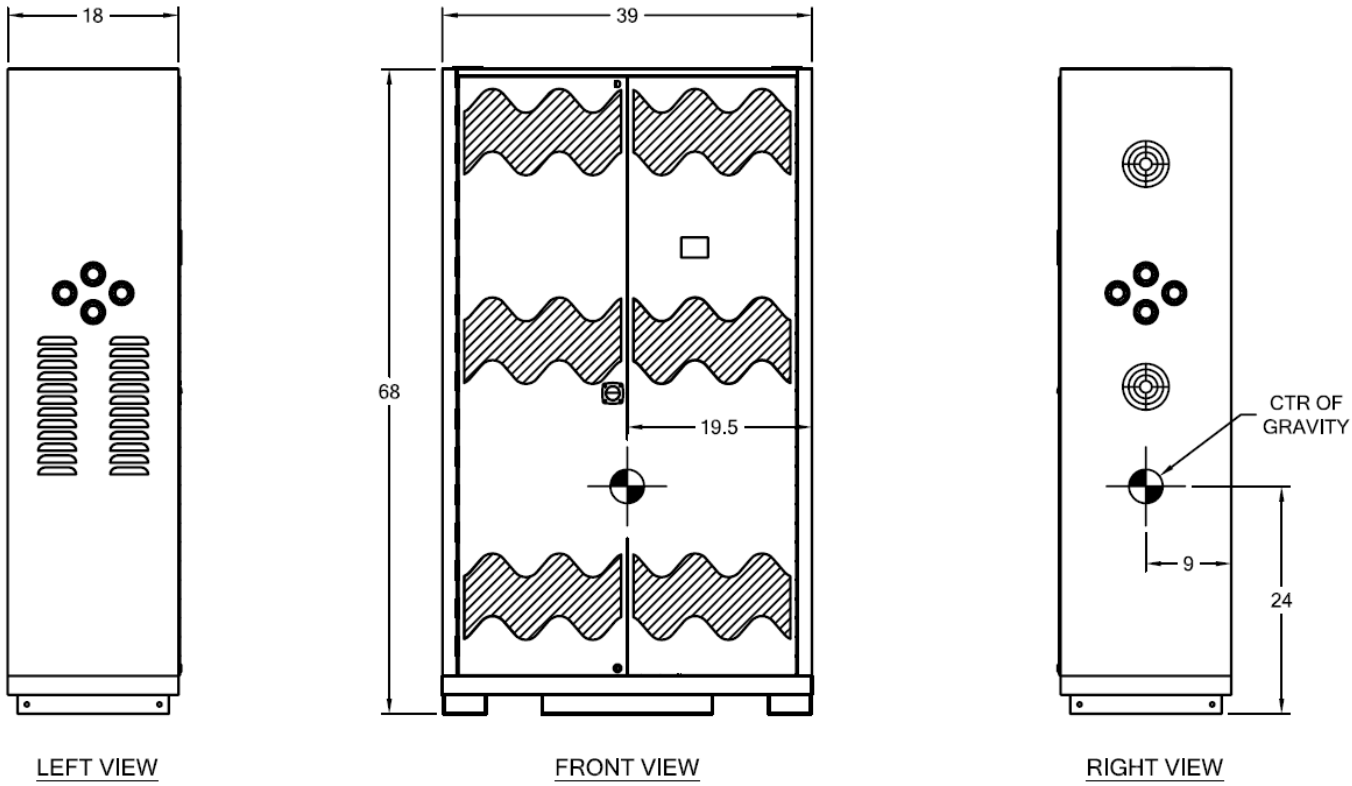


ILLUSTRATION 6-1: CABLE ACCESS AND MOUNTING

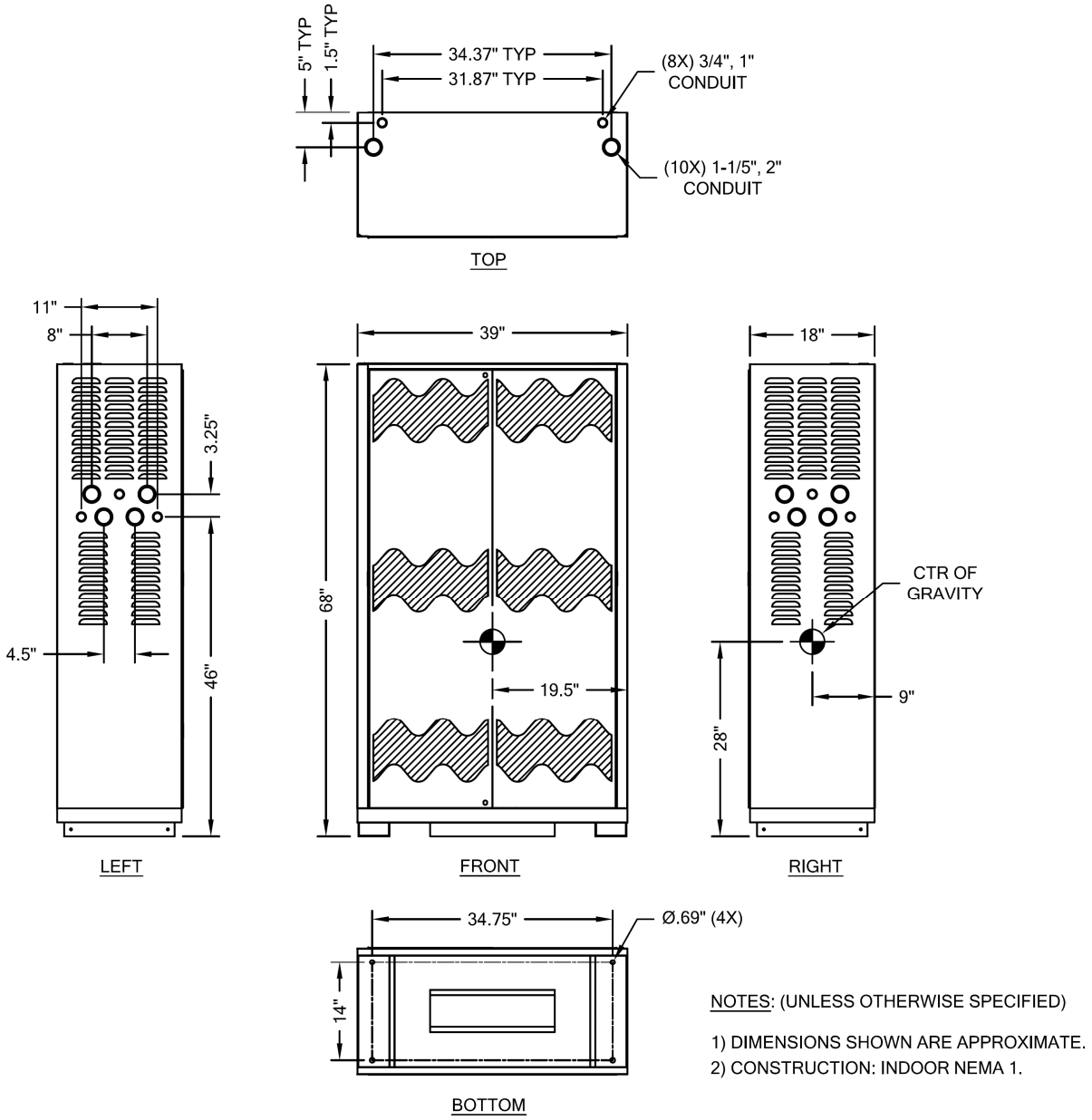


KVA/KW	WT
50 KW	2565
50/40	2463
40/32	2066
30/25	1719
25/20	1679
20/16	1679
15/12	1446
10/8	1083

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. DIMENTIONS SHOWN ARE APPROXIMATE.
2. CONSTRUCTION; INDOOR NEMA 1.
3. CENTER OF GRAVITY IS SHOWN AS TYPICAL AND MAY VARY PER KVA AND OPTION.

ILLUSTRATION 6-2



BATTERY CABINET CENTER OF GRAVITY

ILLUSTRATION 6-3

Caution

Each model of the Power Wave 3 is designed to supply a maximum load which is determined by its kVA (1000's of volt-amperes) and KW rating. Since the power factor is .8, calculate the maximum load using the formula kVA x.8 =KW. It is very important that the load is within the rating of the Power Wave 3 to ensure that the connected loads will be properly supported.

Each electrical device to be powered by the Power Wave 3 should have a specification sheet attached to it, which specifies the amount of power it requires. In addition, this information should be listed in the manual supplied with each piece of equipment. The device's nameplate should also list the electrical requirements of the device.

The total load to be powered by the Power Wave 3 must not exceed its kVA rating. If the total load is exceeded, the Power Wave monitoring will sense an overload condition and a summary alarm will occur.

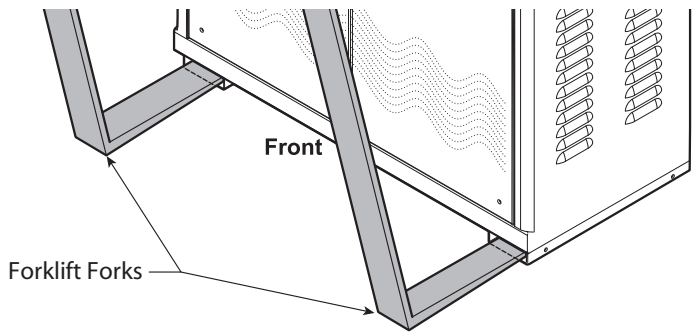
6.1.5 Pre-Installation

All customer connections are brought through knockouts located on the top or on the sides of the unit. The Power Wave 3 consists of one electronics and one or more battery cabinets (depending on the unit size). Before unpacking the equipment, inspect the exterior, the shipping container and the equipment itself for damage that may have occurred during transit. If the shipping container or equipment itself shows evidence of damage, note the damage on the receiving document before signing for receipt of the equipment. Damage claims should be filed directly with the carrier.

6.2 EQUIPMENT UNPACKING

Danger!

EXERCISE EXTREME CARE WHEN HANDLING UNIT AND BATTERY CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. CABINETS WEIGH SEVERAL HUNDRED POUNDS. TEST LIFT AND BALANCE THE CABINETS BEFORE MOVING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES. THE BOTTOM STRUCTURE WILL SUPPORT THE UNIT ONLY IF THE FORKLIFT FORKS ARE COMPLETELY UNDERNEATH THE UNIT.



Remove the equipment from the shipping carton. Since the Power Wave is designed for pad mounting installations, there are no casters. It is suggested that a forklift be used to remove the Power Wave from its shipping pallet. See illustration 6-4 for the location of forklift slots.

ILLUSTRATION 6-4: FORKLIFTING

6.3 UNIT INSTALLATION

6.3.1 Mechanical Installation - Preparing to install unit

1) Before placing the Power Wave 3 onto the mounting bolts (where it will be installed), the conduit knockouts need to be removed. The conduit knockouts are located on the sides and top of the cabinet. (See illustration 6-1)

   NOTE: If site restrictions prevent routing of conduit to the locations where conduit knockouts are located, do not drill holes in the cabinet without first consulting OnLine Power at 800-PWR-SRVC (800-797-7782). The conduit knockouts provided are positioned to prevent airflow disruptions that could cause the unit to overheat. Our engineers are available to assist you in locating the conduit to maintain unit reliability.

2) All external cables to and from to unit and battery cabinet must be provided by the installing contractor based on the National Electrical Code for types of wire and distances. It is important to pre-determent which knockouts will be used to bring cables into and out of the unit. Only remove the conduit knockouts that are to be used.
3) Measure the locations for the conduits on the conduit knockouts.
4) Punch holes in the conduit knockouts for the conduits.
5) Anchor the Power Wave 3 to the mounting pad at the four (4) mounting locations (shown on illustration 6-1).
6) Anchor the conduits to the conduit knockouts

If equipment is not ready for normal operation, it must be protected from dust to prevent damage. This concludes the mechanical installation.

6.3.2 Electrical Connection

Danger!

VERIFY THAT ALL CUSTOMER-SUPPLIED WIRING IS DE-ENERGIZED BEFORE PERFORMING ANY ELECTRICAL WORK. FUILURE TO DO SO COULD RESULT IN ELECTROC**U**TION, INJURY OR DAMAGE TO EQUIPMENT.

Danger!

EVEN WHEN THE UNIT IS OFF, THERE ARE POTENTIALLY DANGEROUS VOLTAGES WITHIN THE UNIT DUE TO THE BATTERIES. EXTREME CARE MUST BE TAKEN WHEN WORKING WITHIN THE POWER WAVE ENCLOSURE TO AVOID THE POSSIBILITY OF ELECTROCUTION, INJURY OR DAMAGE TO THE EQUIPMENT.

Caution **VOLTAGES ON INPUT TERMINAL BLOCK TB10 MUST HAVE CORRECT PHASE ROTATION AND PROPER VOLTAGE (CLOCKWISE A, B, C).**

6.3.3 Customer Connections (Input and Output)

1) Verify that the main input circuit breaker, battery circuit breaker, and output circuit breaker(s), if provided, are in the ”OFF” position. See ILLUSTRATION 6-5 for the location of the circuit breakers.
2) Run the wires through the space between shelf and cabinet using provided knockouts, by following the NEC standard based on the local code and type of wires being used.
(See ILLUSTRATION 6-1 for knockouts location)
3) Connect the input wires to the input terminal block, TB10. Five (5) wires total: Phase A, Phase B, Phase C, neutral, and ground to the terminal shown on the Ground Lug located on the based of the cabinet.
   - Connect Phase A, B, C

From	1	--Phase A
Utility	2	--Phase B
Power	3	--Phase C
Input Power	4	--Neutral

   - Please refer to the functional diagram for Dual Input Power System Illustration 2-5 and 2-6.
4) Connect the output wires to the output terminal block, TB12: Five (4) wires total: Phase A, Phase B, Phase C, neutral, and ground. To tighten connections, use torque value on terminal block (2/0 - #6 awg, 120in-lbs/14NM).

To	1	--Phase A
Critical	2	--Phase B
Load	3	--Phase C
Output Power	4	--Neutral

5) Connect TB6 (the battery terminal block inside the unit), three (3) wires for (+),(-), ground based on local code , wire type and distance to external battery cabinet circuit breaker (These cables are not provided).

Caution **Do not apply power to the Power Wave 3 at this time. (Refer to battery connection diagram)**

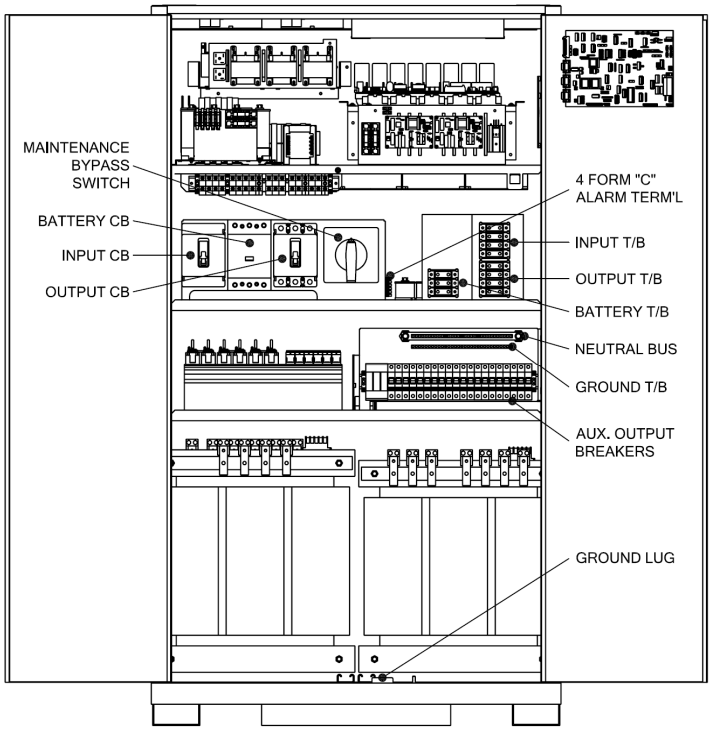


ILLUSTRATION 6-5: POWER WAVE 3 CUSTOMER CONNECTION

- CONNECT OUTPUT POWER TO OUTPUT POWER TB11.
  Phase A, Phase B, Phase C, Neutral as shown above
- This concludes the electrical connections.

  If there are no requirements for remote signaling, section 3.4 may be skipped.

6.4 REMOTE SIGNALING CONNECTION FORM "C" DRY CONTACT (OPTION)

The Power Wave 3 includes the feature of providing dry relay contacts for remote signaling capabilities. Signals available for remote annunciation are:

"INPUT MALFUNCTION" - N/O contact that closes upon loss of input power.

"LOW BATTERY" - N/O contact that closes when the unit is on battery operation and the batteries approach low limit discharge status.

"BYPASS ON" - N/O contact that closes when the unit transfers the load to static by-pass.

"SUMMARY ALARM" - N/O contact that closes when the unit has any one of the following alarm conditions: Internal malfunction, system overheating, input frequency out of tolerance, low battery, DC bus OV/UV, battery charger malfunction, unit on bypass, overload and battery under voltage.

6.4.1 Dry relay contacts for remote signaling are provided through the connector located on the inside panel (remove distribution panel) See illustration 6-5.

Dry relay contacts have the following maximum ratings:

- 125 volts (AC or DC) maximum.
- 1.25 amperes maximum.
- 30 watts / 50 VA maximum.
- It is important that contact ratings are observed to prevent damage to the relays and the Control Board.

6.4.2 Determine which signals will be used. Connect wires (customer-supplied) to the connector.

6.4.3 See illustration 6-5 for location of dry C contacts terminal.

This concludes the installation procedure. Please proceed to Section 3 - Start-Up.

6.5 BATTERY STORAGE

The Power Wave 3 can be placed in storage while not in use. Provide a protected environment, which meets the environmental parameters listed below.

- AMBIENT TEMPERATURE -20°C to 70°C (-4°F to 158°F)
- RELATIVE HUMIDITY 0% to 95% non-condensing

If the Power Wave 3 batteries will be stored for three months or longer, batteries should be charged for 24 hours every three-months (to avoid permanent damage to the batteries).

6.5.1 Battery Maintenance and Recharge

During long-term storage, the batteries are subject to aging and deterioration. After visual inspection, if the batteries need to be replaced, contact OnLine Power Services (1-800-PWR-SERV –1-800-797-7782). Matching battery type and manufacture is required.

If the unit is stored in its original packaging, unpack the unit using the unpacking procedures outlined in Equipment Unpacking Section 6.2.

If the unit is not connected to a source of power, first connect it to an appropriate power source using the procedures in unit Installation Section 6.3.

Then recharge the batteries as follows:

1) Unlock and open front doors.
2) Set AC input power source to ON.
3) Close input circuit breaker and wait for 1 minute.
4) Close battery circuit breaker, only when unit Normal is displayed on screen.
5) The unit automatically recharges batteries. The LCD panel will indicate the battery voltage and charging current.
6) Allow unit to run for 24 hours minumun to charge batteries fully.
7) When batteries have reached partial charge level, the battery charging current will be under 1 Amp on LCD panel.
8) Open CB2 Battery Breaker.
9) Turn OFF input power to the unit.
10) Close and lock front door or use an external charger to charge each individual battery.